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SMITHSONIAN INSTITUTION

HARRIMAN ALASKA SERIES

VOLUME XIV

Monograph of the Shallow-water
Starfishes of the North Pacific Coast
from the Arctic Ocean to California

(WITH 110 PLATES)

BY

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Professor Emeritus of Yale University

PART 2. PLATES



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Shallow-water Starfishes of the North Pacific
Coast from the Arctic Ocean to California

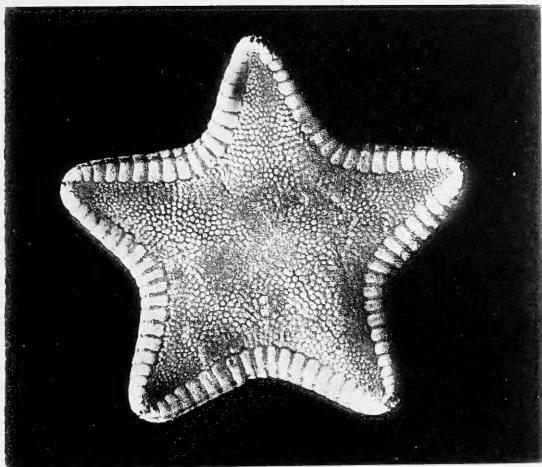
PLATES I-CX WITH EXPLANATIONS

PLATE I.

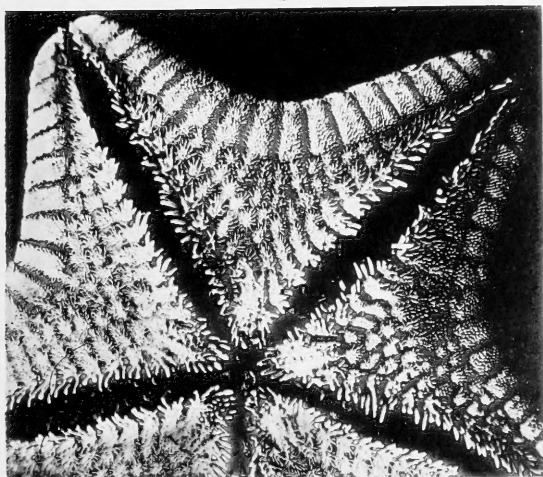
FIG. 1. *Glyphaster anomalus* (Fisher). Dorsal side; $\times 2$.

FIG. 2. The same specimen. Actinal side; $\times 4$. Alaska, Harriman Expedition.

1



2



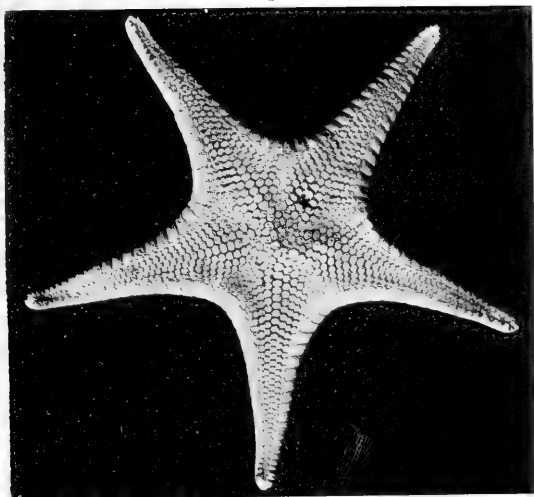
1, 2. GLYPHASTER ANOMALUS (Fisher)

PLATE II.

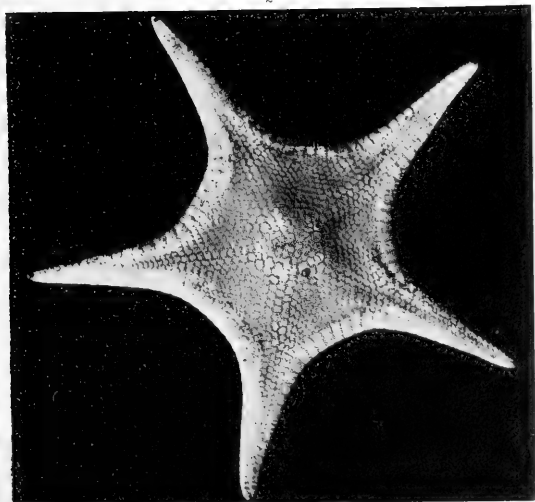
FIG. 1. *Mediaster æqualis* Stimpson. Dorsal side; about natural size.

FIG. 2. *Mediaster bairdii* Verrill. Type. Dorsal side; about natural size.

1



2



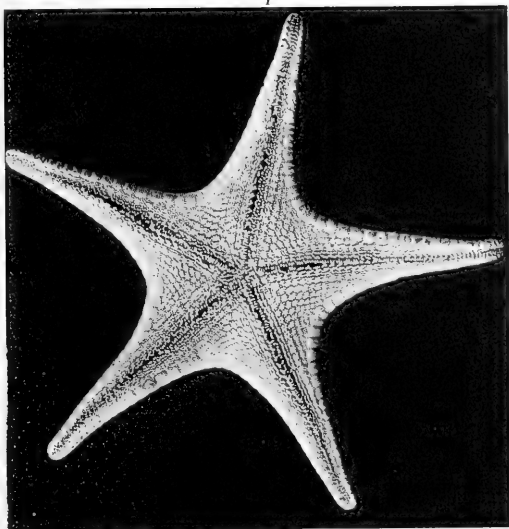
1. *MEDIASTER A-EQUALIS* Stimpson
2. *MEDIASTER BAIRDII* Verrill. Type

PLATE III.

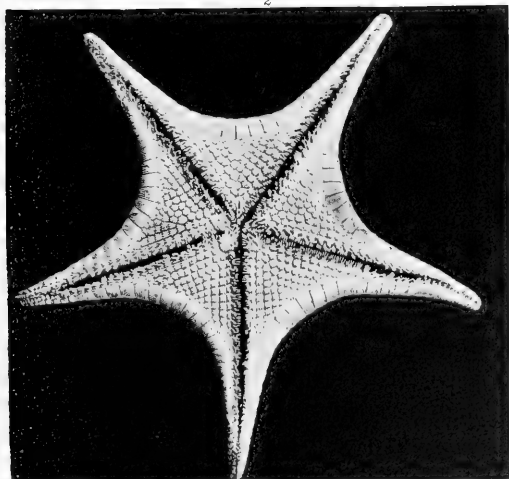
FIG. 1. *Mediaster æqualis* Stimpson. Ventral side; about natural size.

FIG. 2. *Mediaster bairdii* Verrill. Type. Ventral side; about natural size.

1



2

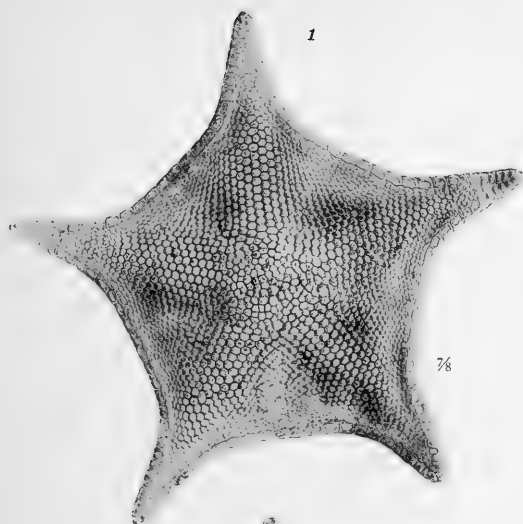


1. *MEDIASTER ÆQUALIS* Stimpson
2. *MEDIASTER BAIRDII* Verrill. Type

PLATE IV.

FIG. 1. *Ceramaster granularis* (Retz.) Verrill. Dorsal side; about $\frac{7}{8}$ natural size. West Atlantic. Station 2506.

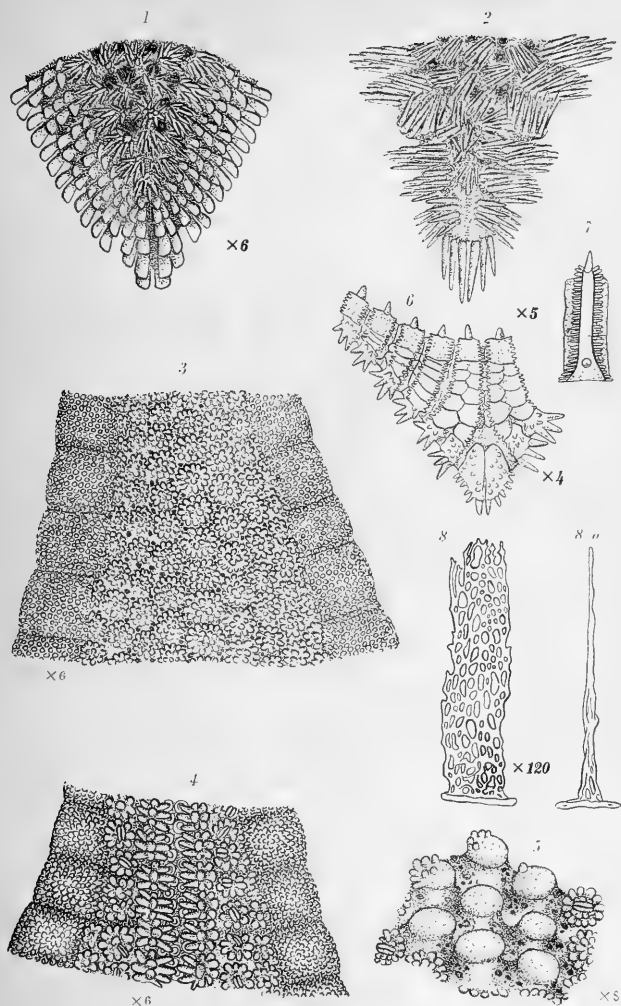
FIG. 2. The same specimen. Ventral side; about $\frac{7}{8}$ natural size.



1, 2. CERAMASTER GRANULARIS (Retz.)

PLATE V.

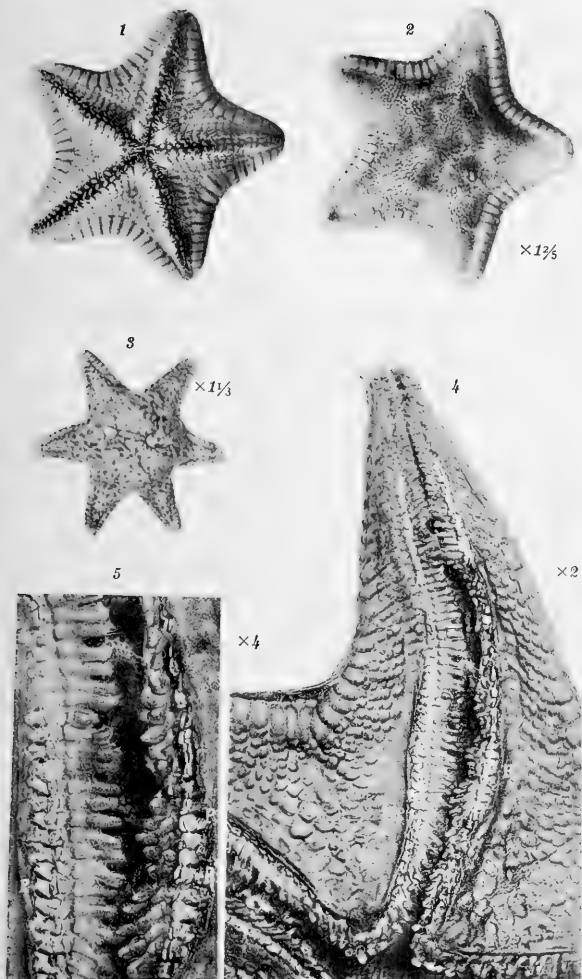
- FIG. 1. *Henricia leviuscula*, var. *spatulifera* Verrill. Type. One of the actinal interradiar areas, jaws, and proximal adambulacral spines; $\times 6$. Monterey. Yale Mus.
- FIG. 2. *Crossaster papposus* (Linn.) M. & Trosch. An interradiar area and jaw; enlarged.
- FIGS. 3, 4. *Mediaster aqualis* Stimpson. Portions of dorsal and actinal sides of a ray; $\times 6$.
- FIG. 5. The same. Portion of dorsal side of a ray with spinules removed, showing plates and papular areas; $\times 8$.
- FIG. 6. *Ctenodiscus crispatus* (Retz.) D. & Kor. Portion of an interradiar area, inferomarginal plates, and jaws; after Ludwig, from a Bering Sea specimen; $\times 4$.
- FIG. 7. The same. Front view of upper and under marginal plates; $\times 5$. From the same.
- FIGS. 8, 8a. The same. One of the fasciolar spinules, side and profile views; $\times 120$. From the same.



1. *HENRICIA LEVIUSCULA*, var. *SPATULIFERA* Verrill. Type
2. *CROSSASTER PAPPOSUS* (Linn.)
- 3, 4, 5. *MEDIASTER ÆQUALIS* Stimpson
- 6, 7, 8. *CTENODISCUS CRISPATUS* (Retz.)

PLATE VI.

- FIG. 1. *Glyphaster anomalus* (Fisher) Verrill. Actinal side; $\times 1\frac{2}{5}$. British Columbia.
- FIG. 2. The same specimen. Dorsal side; $\times 1\frac{2}{5}$.
- FIG. 3. *Dermasterias imbricata* (Grube) Perrier. A young specimen, six-rayed. Dorsal side; $\times 1\frac{1}{3}$.
- FIG. 4. The same, adult. Details of ventral side; *P, P*, pedicellariæ; $\times 2$.
- FIG. 5. The same specimen. Portion more enlarged. *P, P*, bivalved pedicellariæ; *P', P'*, trivalved pedicellariæ; $\times 4$.



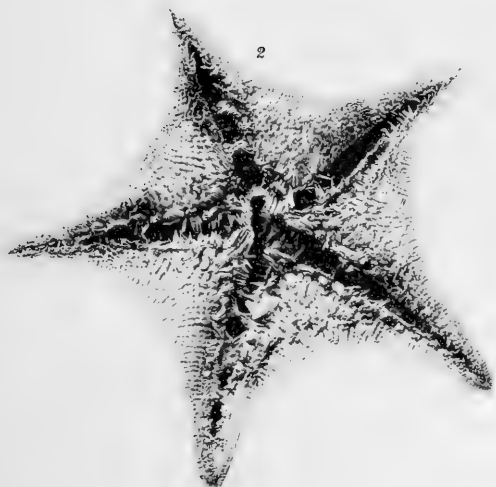
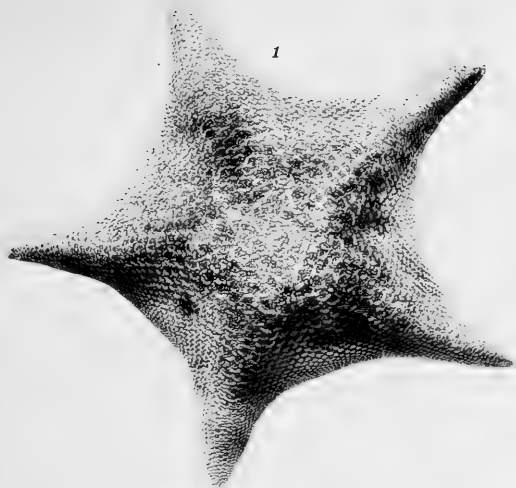
1, 2. *GLYPHASTER ANOMALUS* (Fisher)

3. *DERMASTERIAS IMBRICATA* (Grube). A young six-rayed specimen

4, 5. The same, adult. Details of ventral side

PLATE VII.

- FIG. 1. *Patiria miniata* (Brandt) Verrill. Dorsal side; about $\frac{3}{4}$ natural size.
FIG. 2. The same specimen. Ventral side. Yale Mus.

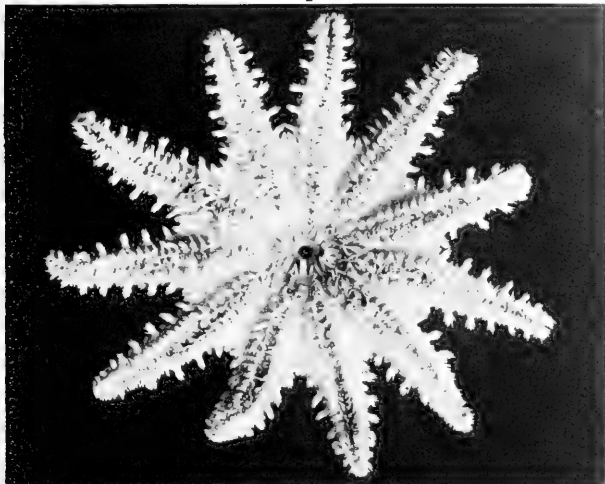


1, 2. PATIRIA MINIATA (Brandt)

PLATE VIII.

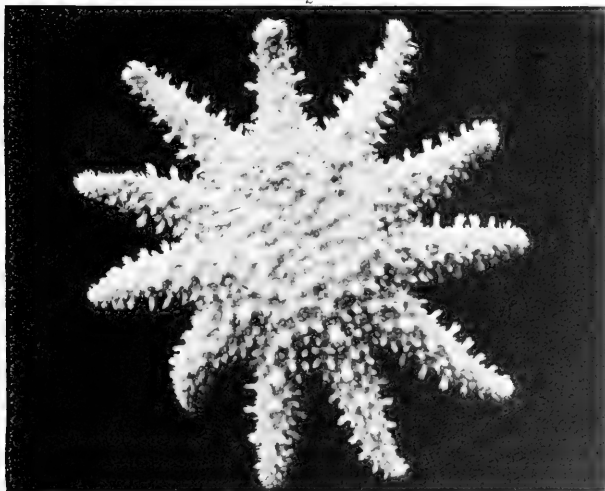
- FIG. 1. *Crossaster papposus* (Linn.) M. & Troschel. A young specimen, in alcohol. Ventral side; $\times 1\frac{3}{4}$.
- FIG. 2. The same specimen. Dorsal side; $\times 1\frac{3}{4}$. Berg Bay. Yale Mus.

1



×134

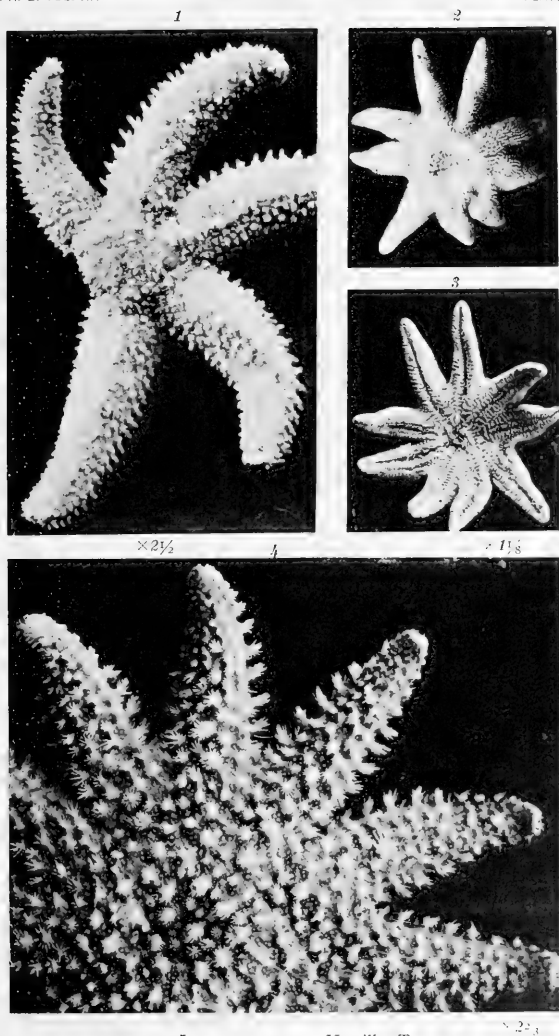
2



1, 2. *CROSSASTER PAPPOSUS* (Linn.)

PLATE IX.

- FIG. 1. *Leptasterias coei* Verrill. Type. In alcohol; $\times 2\frac{1}{2}$. Alaska, Harriman Expedition. Yale Mus.
- FIG. 2. *Solaster endeca* (Linn.) Forbes. Young. Dorsal side; $\times 1\frac{1}{8}$. Harriman Expedition.
- FIG. 3. The same specimen. Ventral side; $\times 1\frac{1}{8}$. Juneau, 20 fathoms.
- FIG. 4. *Crossaster papposus* (Linn.) M. & Troschel. Details of dorsal side of a young specimen in alcohol; $\times 2\frac{2}{3}$. Berg Bay, Harriman Expedition. Yale Mus.



1. *LEPTASTERIAS COEI* Verrill. Type
- 2, 3. *SOLASTER ENDECA* (Linn.)
4. *CROSSASTER PAPPOSUS* (Linn.)

PLATE X.

- FIG. 1. *Solaster stimpsoni* Verrill. Type. Actinal side; about $\frac{3}{8}$ natural size.
British Columbia. No. 5136. Yale Mus.
- FIG. 2. The same specimen. Dorsal side; about $\frac{2}{3}$ natural size.

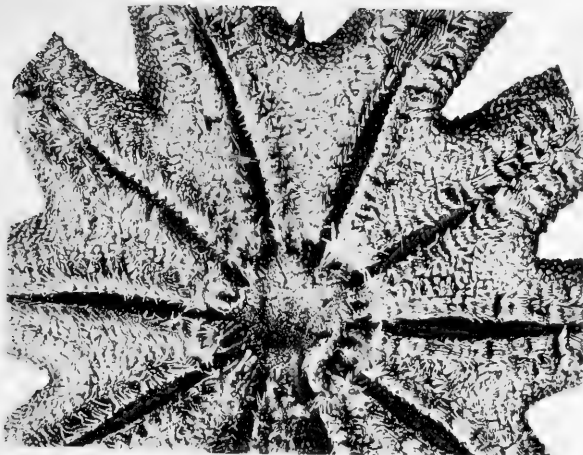


1, 2. *SOLASTER STIMPSONI* Verrill. Type. No. 5407, Yale Mus.

PLATE XI.

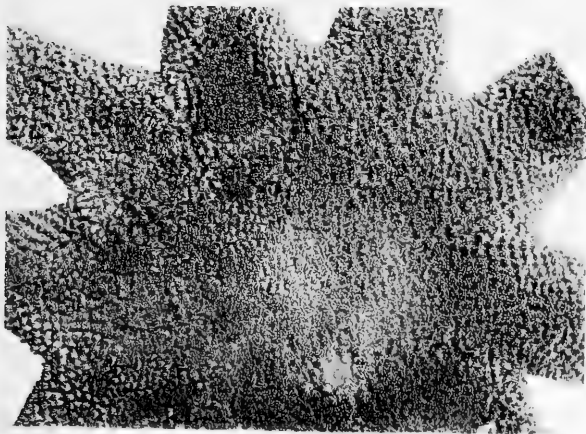
- FIG. 1. *Solaster stimpsoni* Verrill. Cotype. Details of actinal side; $\times 14\frac{1}{2}$.
FIG. 2. The same specimen. Dorsal side; $\times 14\frac{1}{2}$.

1



$\times 14\frac{1}{2}$

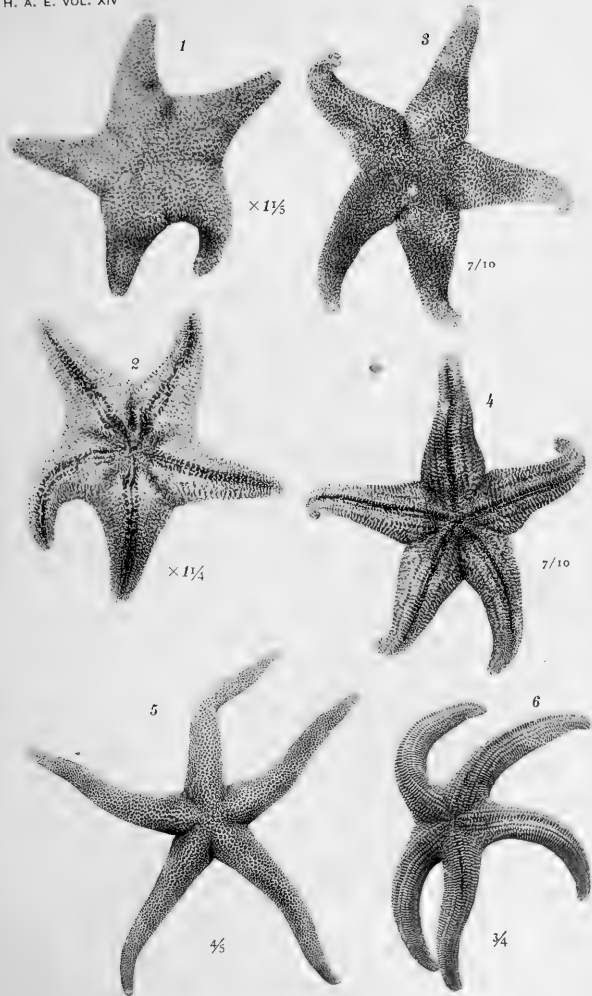
2



1, 2. SOLASTER STIMPSONI Verrill. Cotype

PLATE XII.

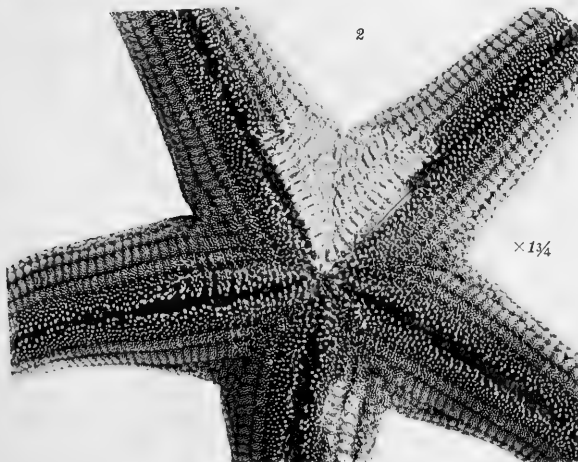
- FIG. 1. *Henricia tumida* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$. Yale Mus.
FIG. 2. The same specimen. Actinal side; $\times 1\frac{1}{4}$.
FIG. 3. *Henricia tumida borealis* Verrill. Type. Dorsal side; about $\frac{7}{10}$ natural size Dutch Harbor. Yale Mus.
FIG. 4. The same specimen. Actinal side; $\frac{7}{10}$ natural size.
FIG. 5. *Henricia leviuscula* (Stimpson). Typical form. Dorsal side; $\frac{2}{3}$ natural size.
FIG. 6. *Henricia leviuscula* (Stimpson), var. *dyscrita* Fisher. Actinal side; $\frac{3}{4}$ natural size.



- 1, 2. *HENRICIA TUMIDA* Verrill. Type
- 3, 4. *HENRICIA TUMIDA BOREALIS* Verrill. Type
5. *HENRICIA LEVIUSCULA* (Stimpson)
6. *HENRICIA LEVIUSCULA* (Stimpson), var. *DYSCRITA* Fisher

PLATE XIII.

- FIG. 1. *Henricia leviuscula* (Stimpson). Details of dorsal side of the typical form; $\times 1\frac{3}{4}$. Yale Mus.
- FIG. 2. The same specimen. Ventral side; with spines partly removed; $\times 1\frac{3}{4}$. Yale Mus.

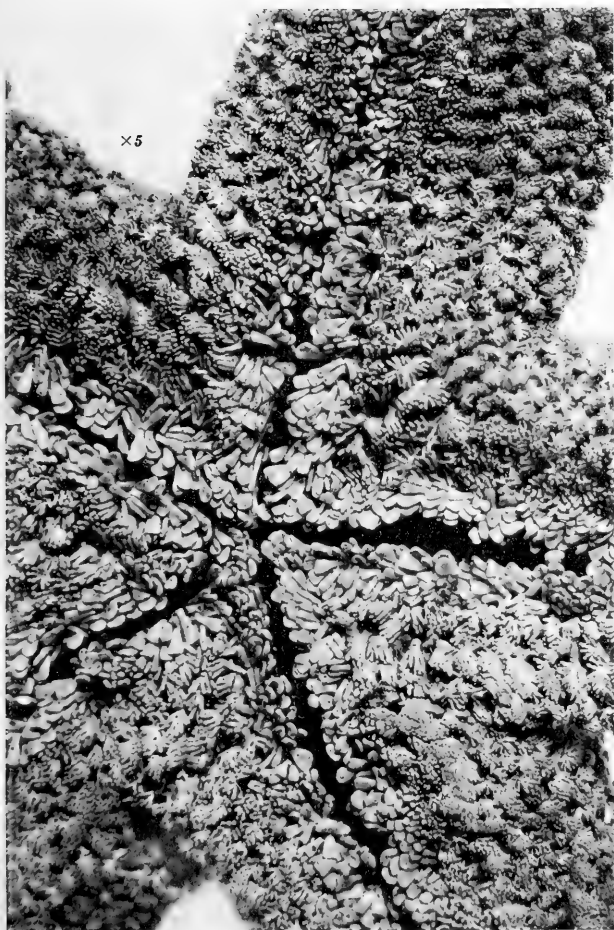


1, 2. *HENRICIA LEVIUSCULA* (Stimpson)



PLATE XIV.

FIG. 1. *Henricia leviuscula*, var. *spatulifera* Verrill. Type. Details of ventral side; $\times 5$. Monterey, Calif. Yale Mus., No. 2238.



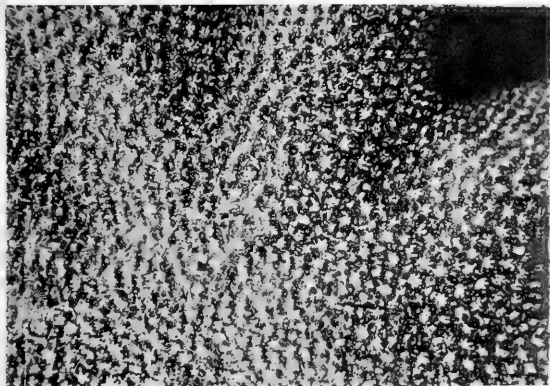
1. *HENRICIA LEVIUSCULA*, var. *SPATULIFERA* Verrill. Type



PLATE XV.

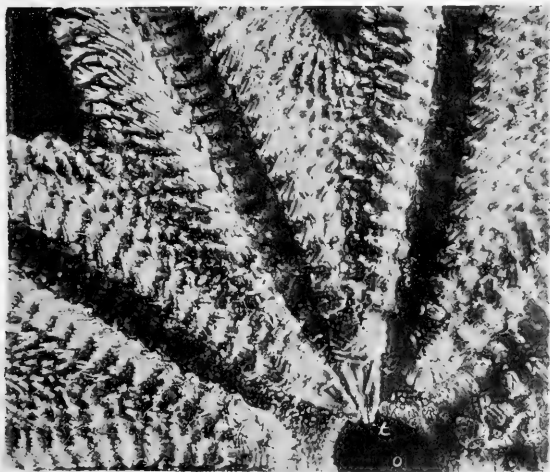
- FIG. 1. *Solaster stimpsoni* Verrill. Type. Same specimen as on pl. x (No. 5407, Yale Mus.). Details of dorsal side of disk; $\times 3$. Yale Mus.
- FIG. 2. The same specimen. Details of actinal side; *O*, mouth; *t*, peroral spines; $\times 3$.

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1, 2. SOLASTER STIMPSONI Verrill. Type. No. 5407, Yale Mus.

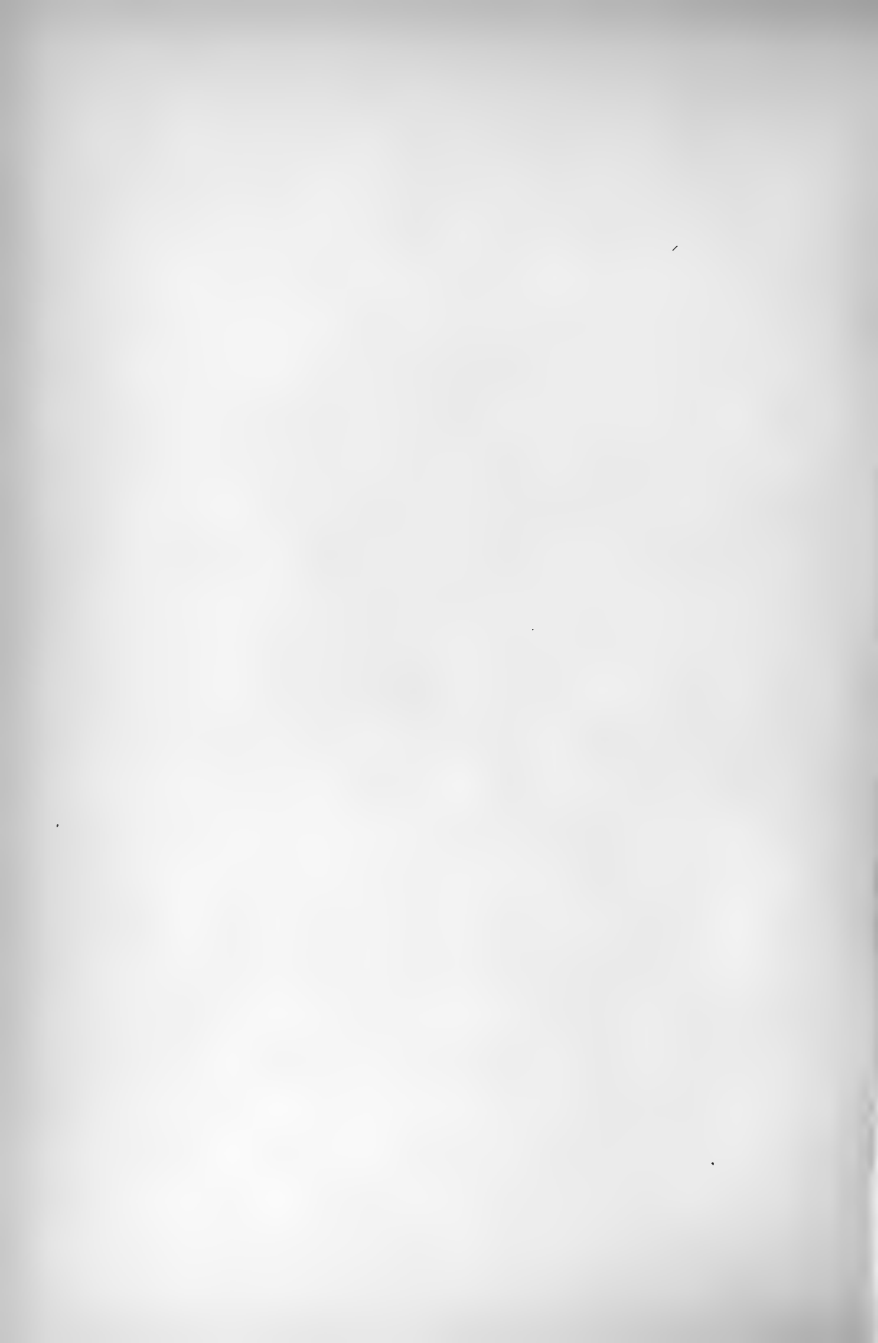
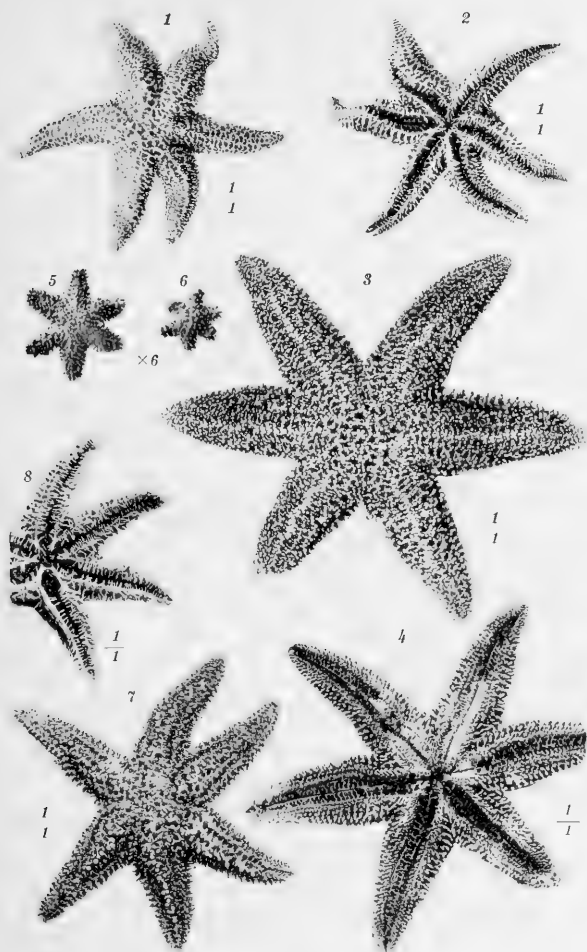


PLATE XVI.

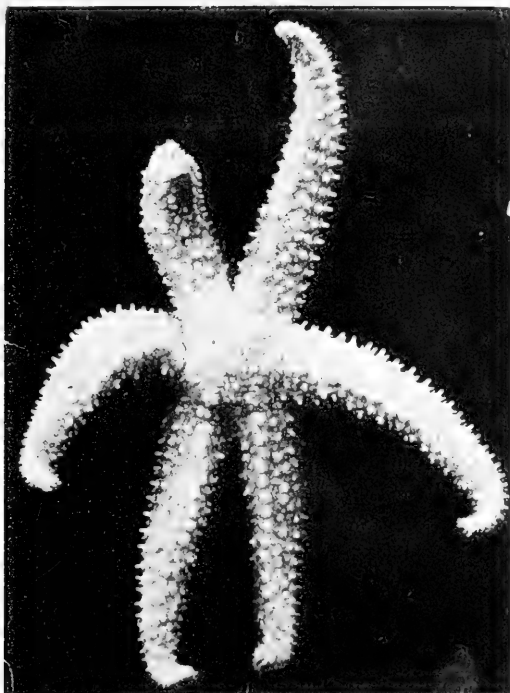
- FIG. 1. *Leptasterias epichlora alaskensis*, var. *carinella* Verrill. Young. Dorsal side; natural size.
- FIG. 2. The same specimen. Actinal side; natural size. Yale Mus.
- FIG. 3. The same, var. *siderea* Verrill. Type. Dorsal side; about natural size.
- FIG. 4. The same specimen. Actinal side; about natural size. Yale Mus.
- FIGS. 5-6. The same. Very young stages; much enlarged (\times about 6). Yale Mus.
- FIG. 7. *Leptasterias dispar* Verrill. Type. Dorsal side; about natural size. Yale Mus.
- FIG. 8. *Leptasterias aequalis* (Stimpson), var. Ventral side; about natural size.



- 1, 2. *LEPTASTERIAS EPICHLORA ALASKENSIS*, var. *CARINELLA* Verrill
 3-6. The same, var. *SIDEREA* Verrill. Type
 7. *LEPTASTERIAS DISPAR* Verrill. Type
 8. *LEPTASTERIAS ÆQUALIS* (Stimpson), var.

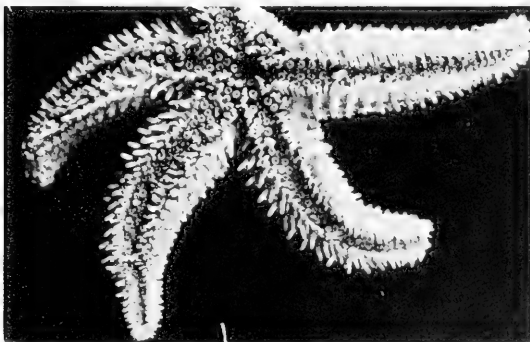
PLATE XVII.

- FIG. 1. *Leptasterias coei* Verrill. Type. In alcohol. Dorsal side; $\times 2\frac{1}{4}$.
Berg Bay. Yale Mus.
- FIG. 2. The same. Cotype. Specimen with shorter rays from Berg Bay.
Actinal view; $\times 2\frac{1}{4}$. Yale Mus.



× 214

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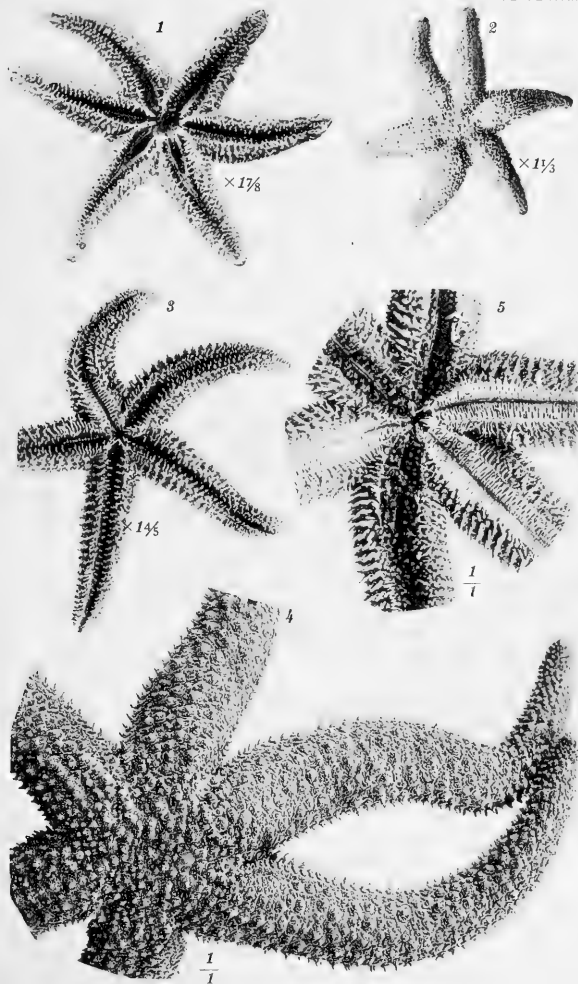


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1, 2. *LEPTASTERIAS COEI* Verrill. Type. Berg Bay. Yale Mus.

PLATE XVIII.

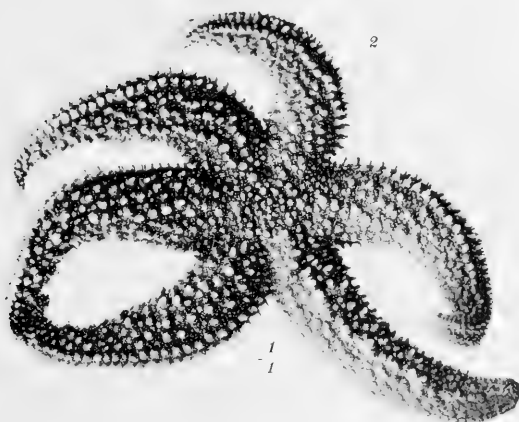
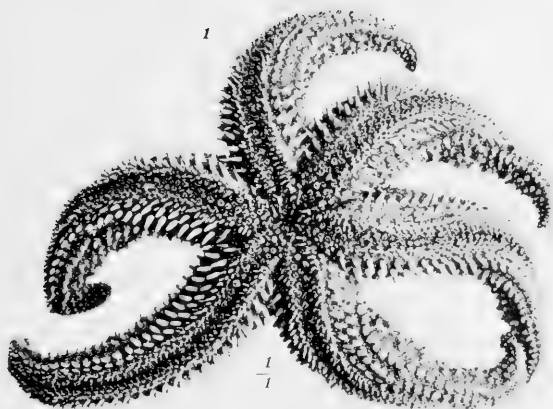
- FIG. 1. *Leptasterias aequalis* (Stimpson). Typical form, from Monterey Bay. Actinal side; $\times 1\frac{7}{8}$.
- FIG. 2. The same specimen. Dorsal side; $\times 1\frac{3}{4}$.
- FIG. 3. *Leptasterias leptalea* Verrill. Type. Ventral side; $\times 1\frac{1}{2}$. Sitka. Yale Mus.
- FIG. 4. *Orthasterias merriami* Verrill, sp. nov. Type. Dorsal side; about natural size.
- FIG. 5. The same specimen. Details. Actinal side; natural size. Juneau. Univ. of Calif.



1, 2. *LEPTASTERIAS ÆQUALIS* (Stimpson)
 3. *LEPTASTERIAS LEPTALEA* Verrill. Type
 4, 5. *ORTHASTERIAS MERRIAMII* Verrill. Type

PLATE XIX.

- FIG. 1. *Orthasterias merriami* Verrill. Type. In alcohol. Actinal side;
natural size. Glacier Bay.
- FIG. 2. The same specimen. Dorsal side. Yale Mus.

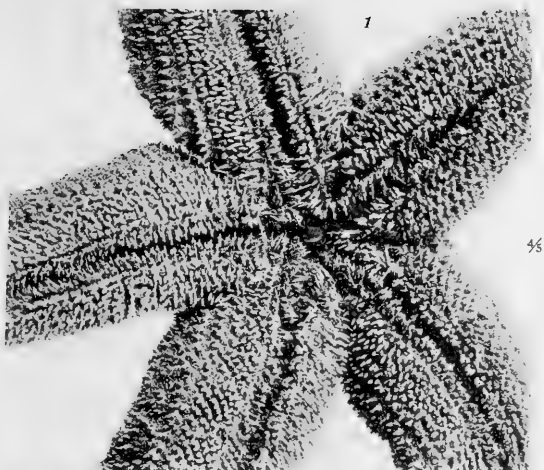


1, 2. ORTHASTERIAS MERRIAMII Verrill. Cotype

PLATE XX.

FIG. 1. *Evasterias acanthostoma* Verrill. Type. Actinal side; $\frac{1}{2}$ natural size.

FIG. 2. The same specimen. Portion of dorsal side; $\times 13\frac{1}{2}$. Popof Is., Alaska. Professor Ritter. Univ. Calif.



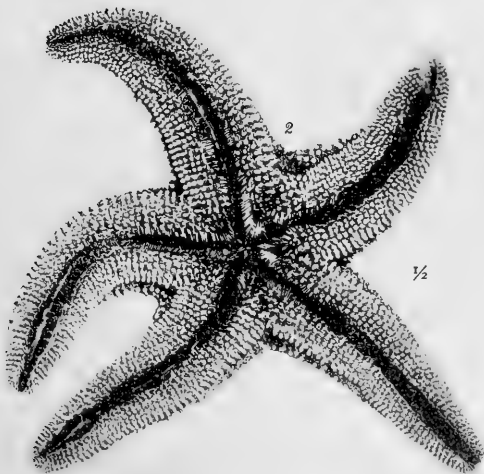
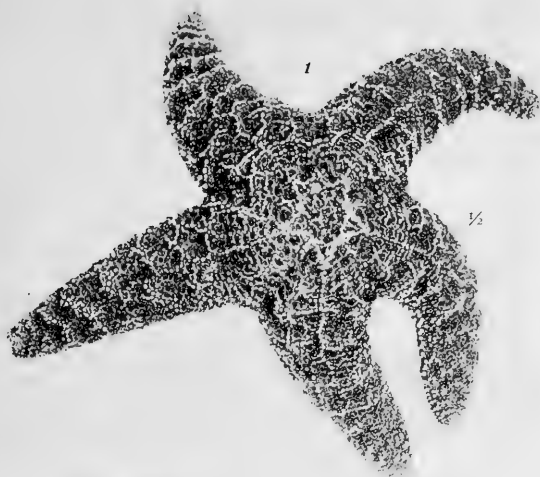
1, 2. *EVASTERIAS ACANTHOSTOMA* Verrill. Type



PLATE XXI.

FIG. 1. *Pisaster ochraceus* (Brandt). Dorsal side; about $\frac{1}{2}$ natural size.

FIG. 2. The same. Actinal side; $\frac{1}{2}$ natural size.



1, 2. *PISASTER OCHRACEUS* (Brandt)

PLATE XXII.

FIG. 1. *Evasterias troschelii* (Stimpson). Typical form, in alcohol. Actinal side; $\times 1\frac{1}{3}$.

FIG. 2. The same specimen. Dorsal side; $\times 1\frac{1}{3}$. Sitka. Yale Mus.



1, 2. *EVASTERIAS TROSCHELII* (Stimpson)

PLATE XXIII.

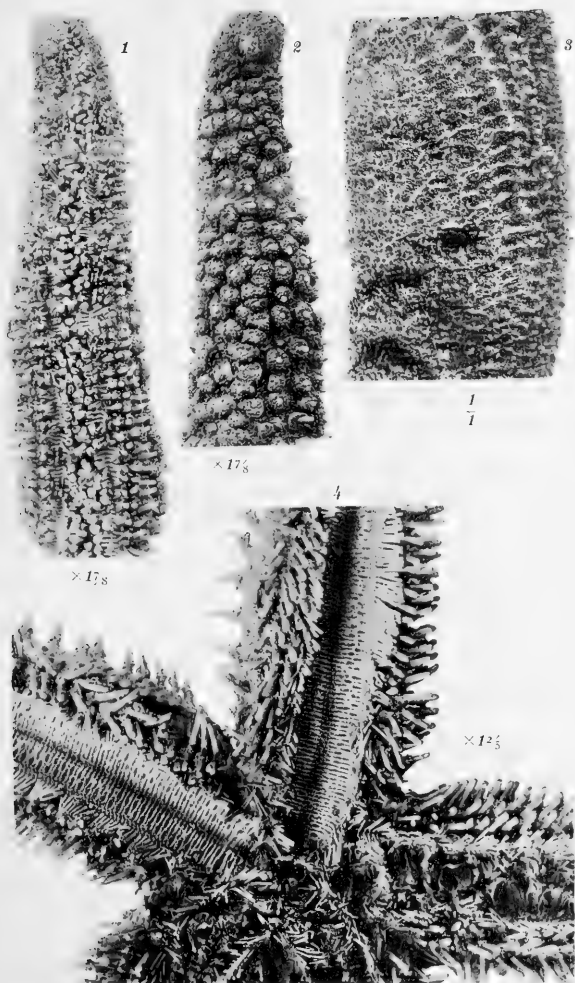
- FIG. 1. *Orthasterias dawsoni* Verrill. Type. Ventral side; $\frac{2}{3}$ natural size.
FIG. 2. The same specimen. Dorsal side; $\frac{7}{10}$ natural size. British Columbia,
Canadian Geol. Survey.



1, 2. *ORTHASTERIAS DAWSONI* Verrill. Type

PLATE XXIV.

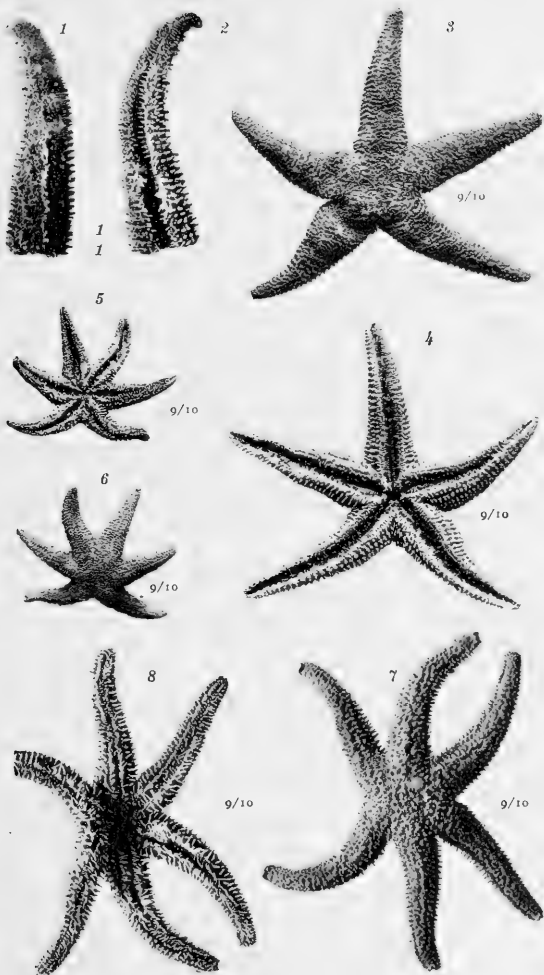
- FIG. 1. *Orthasterias columbiana* Verrill. Type. In alcohol. Actinal side of a ray; $\times 1\frac{7}{8}$.
- FIG. 2. The same specimen. Dorsal side of a ray; $\times 1\frac{7}{8}$. Yale Mus. Same specimen as pl. XIX.
- FIG. 3. *Evasterias acanthostoma* Verrill. Type. Part of a ray (dry), side view; about natural size. Univ. Calif.
- FIG. 4. *Orthasterias columbiana* Verrill. Details of actinal side; $\times 1\frac{7}{8}$. Yakutat, Alaska. Yale Mus.



1, 2. ORTHASTERIAS COLUMBIANA Verrill. Type
 3. EVASTERIAS ACANTHOSTOMA Verrill. Type
 4. ORTHASTERIAS COLUMBIANA Verrill

PLATE XXV.

- FIG. 1. *Evasterias troschelii*. Type of Stimpson. Part of a ray, dorsal side; about 9/10 natural size.
- FIG. 2. The same specimen. Ventral side. U. S. Nat. Mus.
- FIGS. 3, 4. *Ctenasterias cribraria* (Stimpson). Type of Stimpson. Dorsal and ventral sides; about 9/10 natural size.
- FIGS. 5, 6. *Leptasterias aqualis* (Stimpson). Type of Stimpson. Ventral side; about 9/10 natural size. U. S. Nat. Mus.
- FIGS. 7, 8. *Leptasterias hexactis* (Stimpson). Type of Stimpson. Ventral side; about 9/10 natural size. U. S. Nat. Mus.

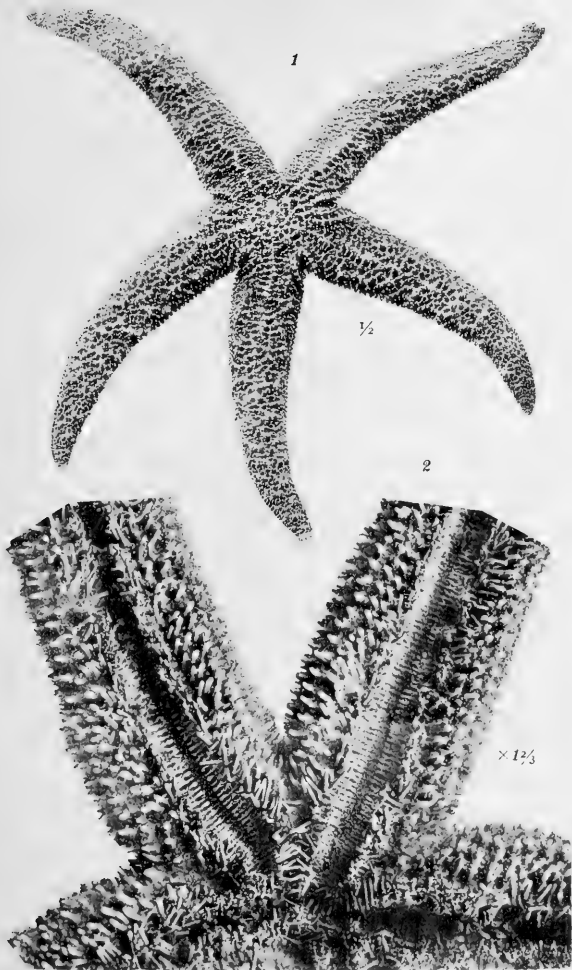


1, 2. *EVASTERIAS TROSCHELII* (Stimpson). Type of Stimpson
 3, 4. *CENASTERIAS CRIERARIA* (Stimpson). Type of Stimpson
 5, 6. *LEPTASTERIAS ÆQUALIS* (Stimpson). Type of Stimpson
 7, 8. *LEPTASTERIAS HEXACTIS* (Stimpson). Type of Stimpson

PLATE XXVI.

FIG. 1. *Evasterias troschelii* Stimpson. Typical form from Sitka. Dorsal side; about $\frac{1}{2}$ natural size.

FIG. 2. The same specimen. Details of actinal side; $\times 1\frac{2}{3}$. Yakutat. Yale Mus.



1, 2. *EVASTERIAS TROSCHELII* (Stimpson)



PLATE XXVII.

- FIG. 1. *Asterias acerata* Stimpson. Type. Dorsal side; about $\frac{1}{2}$ natural size.
U. S. Nat. Mus.
- FIG. 2. The same specimen. Ventral side; about $\frac{1}{2}$ natural size.

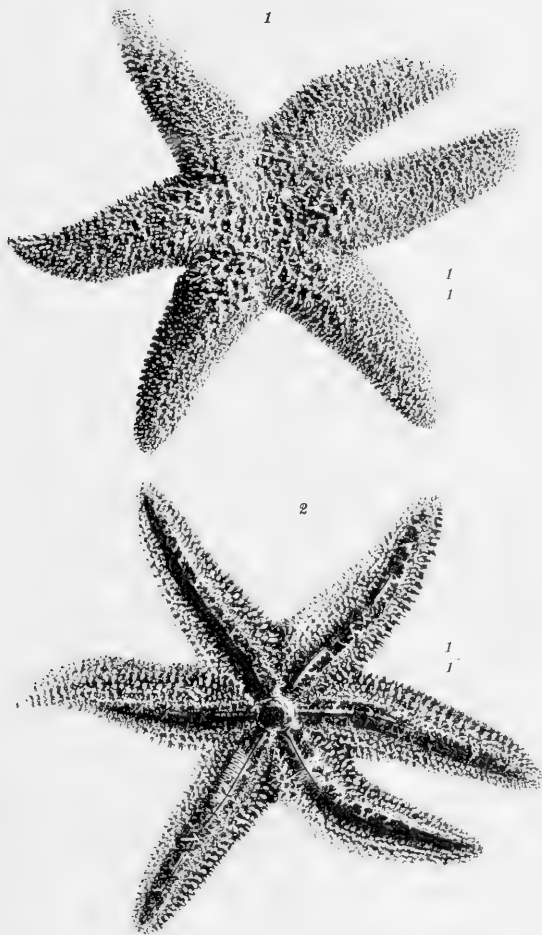


1. *ASTERIAS ACERVATA* Stimpson. Type

PLATE XXVIII.

FIG. 1. *Leptasterias epichlora alaskensis* Verrill. Type. Dorsal side;
natural size.

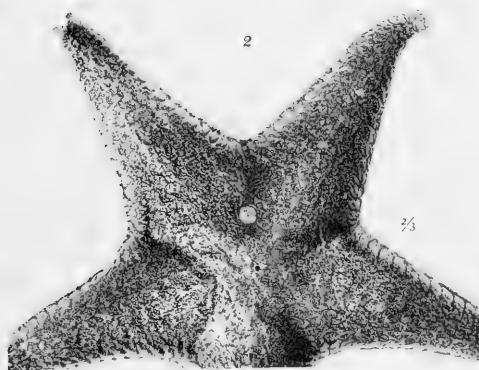
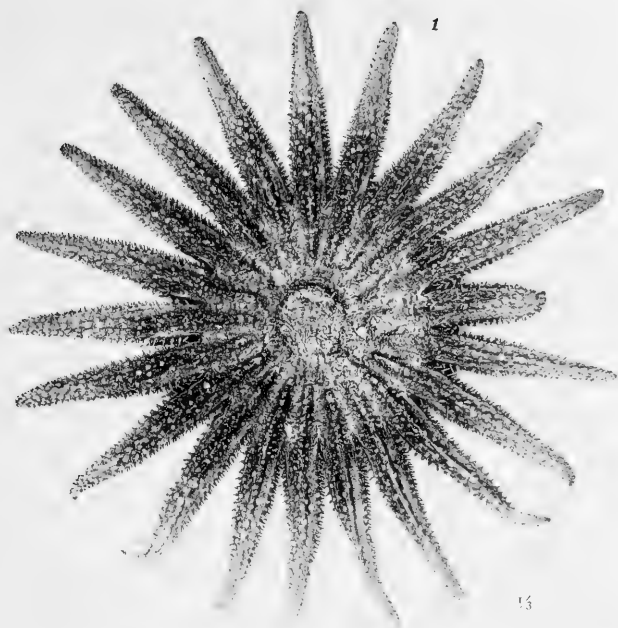
FIG. 2. The same specimen. Ventral side; natural size. Yale Mus.



1, 2. LEPTASTERIAS EPICHLORA ALASKENSIS Verrill. Type

PLATE XXIX.

- FIG. 1. *Pycnopodia helianthoides* (Brandt) Stimpson. Actinal side; about $\frac{1}{3}$ natural size. Yale Mus.
- FIG. 2. *Dermasterias imbricata* (Grube) Perrier. Dorsal side; $\frac{2}{3}$ natural size. Yale Mus.



1. PYCNOPODIA HELIANTHOIDES (Brandt)
2. DERMASTERIAS IMBRICATA (Grube)

PLATE XXX.

FIG. 1. *Pycnopodia helianthoides* (Brandt) Stimpson. Same specimen as pl. xxix, fig. 1. Details of dorsal side; $\times 2\frac{1}{2}$.



PYCNOPIA HELIANTHOIDES (Brandt)

PLATE XXXI.

- FIG. 1. *Pycnopodia helianthoides* (Brandt). Young, in alcohol. Dorsal side; \times about 5.
- FIG. 2. The same specimen. Actinal side. These figures show the inter-budding of new rays, symmetrically to a median plane indicated by the arrows; *a*, *a'*, last-formed rays; *b*, *b'*, previous or first pair of interpolated rays, one on either side of a primary odd ray.



1, 2. PYCNOPODIA HELIANTHOIDES (Brandt). Young, in alcohol

PLATE XXXII.

- FIG. 1. *Pteraster tessellatus* Ives. Ventral side of an alcoholic specimen;
about $\frac{3}{4}$ natural size.
- FIG. 2. The same specimen. Dorsal side. Yale Mus.



PTERASTER TESSELATUS Ives

PLATE XXXIII.

FIG. 1. *Luidiaster dawsoni* (Verrill) Ludwig. Type. Dorsal side; about $\frac{3}{4}$ natural size. Canadian Geol. Survey.



LUIDIASTER DAWSONI (Verrill) Ludwig. Type

TO

PLATE XXXIV.

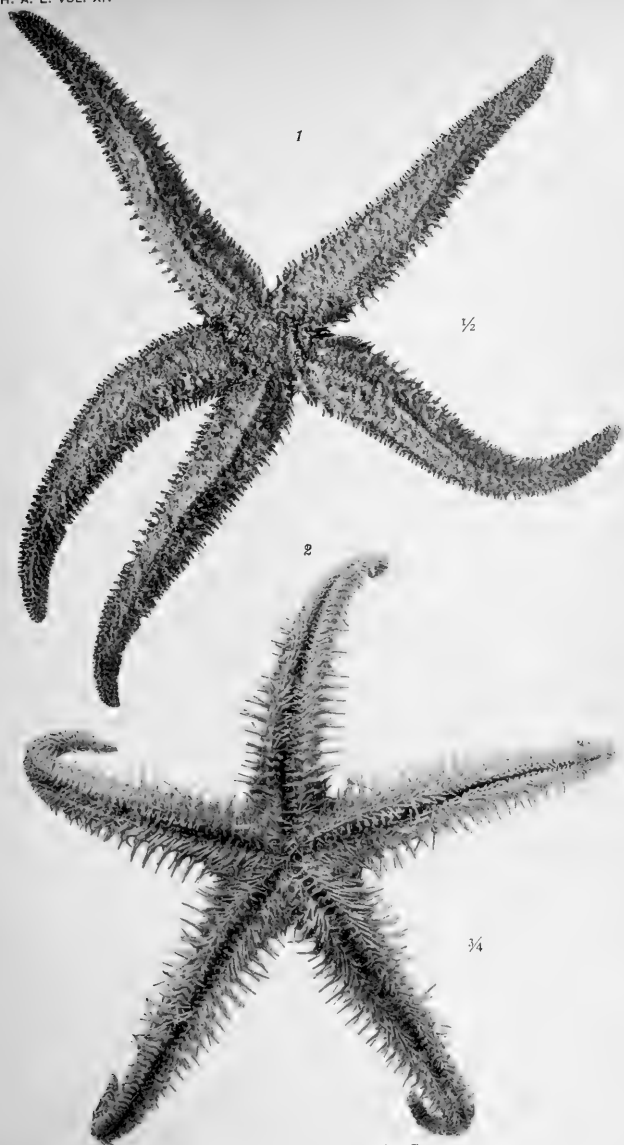
FIG. 1. The same specimen as pl. XXXIII. Details of lower side of disk;
P, P, P, pectinate or fasciolated pedicellariæ; \times about 6.



LUIDIASTER DAWSONI (Verrill) Ludwig. Type. Details

PLATE XXXV.

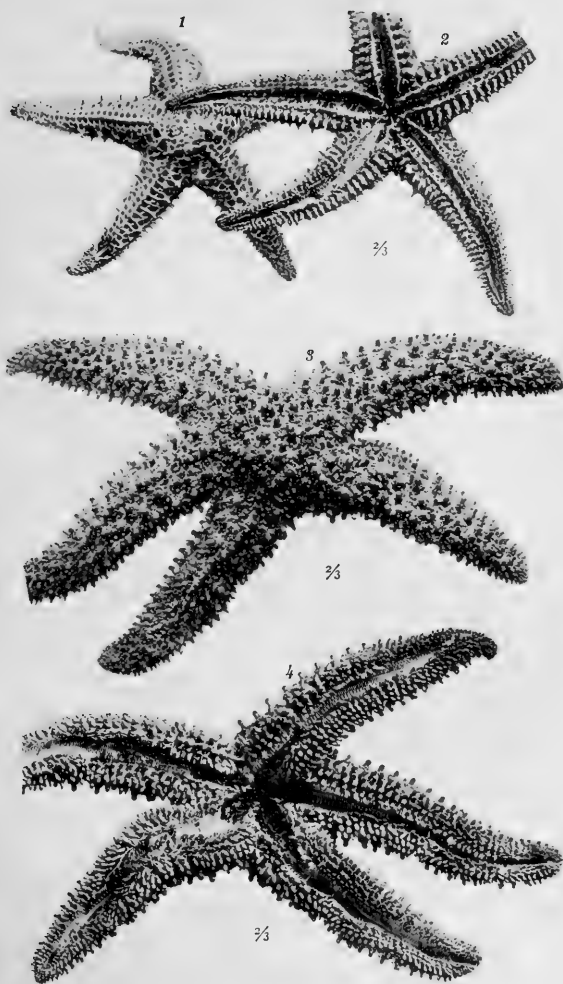
- FIG. 1. *Orthasterias columbiana* Verrill. Type. Same specimen as pl. xxiv, fig. 4. Dorsal side; $\frac{1}{2}$ natural size. Yakutat. Yale Mus.
- FIG. 2. *Luidiaster dawsoni* (Verrill) Ludwig. Type. Same specimen as pls. xxxiii and xxxiv. About $\frac{3}{4}$ natural size. Geol. Surv. Canada.



1. ORTHASTERIAS COLUMBIANA Verrill. Cotype
2. LUIDIASTER DAWSONI (Verrill) Ludwig. Type

PLATE XXXVI.

- FIG. 1. *Pisaster paucispinus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; about $\frac{2}{3}$ natural size.
- FIG. 2. The same. Actinal view; about $\frac{2}{3}$ natural size. U. S. Nat. Mus.
- FIG. 3. *Pisaster capitatus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; $\frac{2}{3}$ natural size.
- FIG. 4. The same specimen. Actinal view; $\frac{2}{3}$ natural size.



1, 2. *PISASTER PAUCISPINUS* (Stimpson) Verrill. Type of Stimpson
 3, 4. *PISASTER CAPITATUS* (Stimpson) Verrill. Type of Stimpson

PLATE XXXVII.

- FIG. 1. *Pisaster giganteus* (Stimpson) Verrill. Type of Stimpson. Dorsal view; about $\frac{1}{5}$ natural size.
- FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.

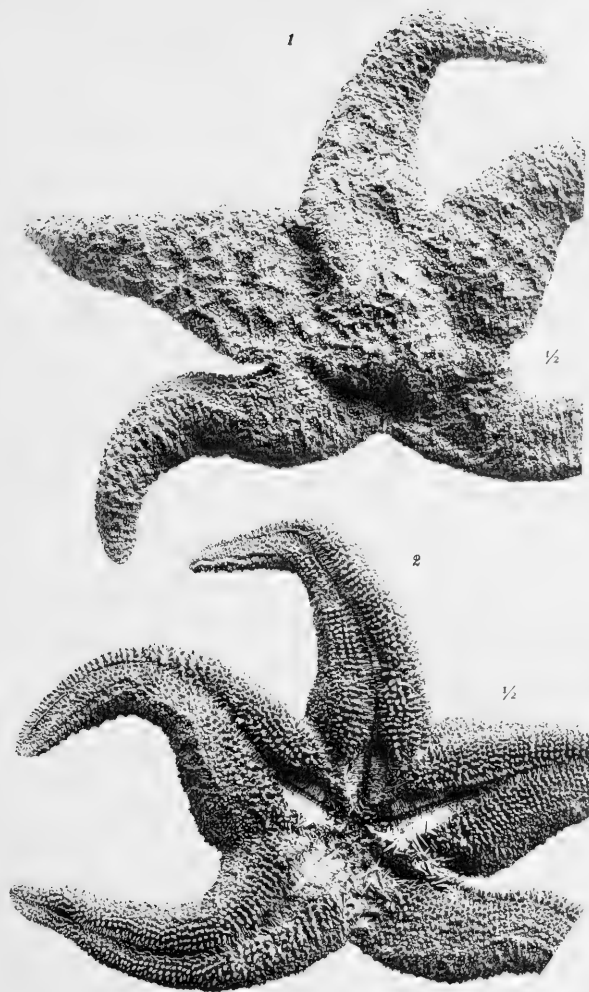


1, 2. *PISASTER GIGANTEUS* (Stimpson) Verrill. Type of Stimpson

PLATE XXXVIII.

FIG. 1. *Pisaster confertus* (Stimpson) Verrill. Type. Dorsal view; about
 $\frac{1}{2}$ natural size.

FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.

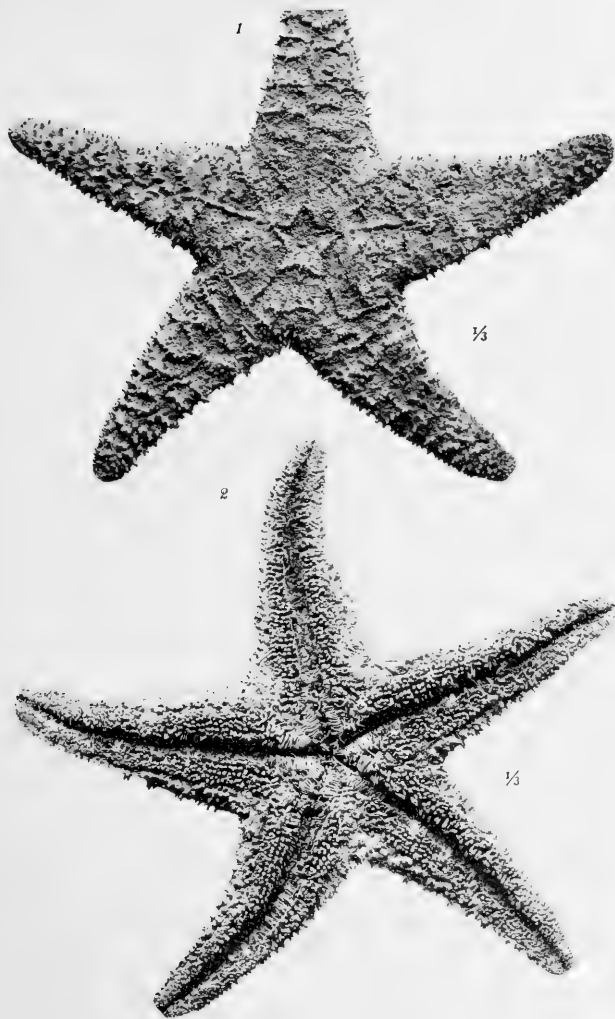


1, 2. *PISASTER CONFERTUS* (Stimpson) Verrill. Type

PLATE XXXIX.

FIG. 1. *Pisaster fissispinus* (Stimpson) Verrill. Type. Dorsal view; about $\frac{1}{3}$ natural size.

FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.



1, 2. *PISASTER FISSISPINUS* (Stimpson) Verrill. Type

PLATE XL.

FIG. 1. *Pisaster lütkenii* (Stimpson) Verrill. Type. Dorsal view; about $\frac{1}{2}$ natural size.

FIG. 2. The same specimen. Actinal view. U. S. Nat. Mus.



1, 2. *PISASTER LÜTKENII* (Stimpson) Verrill. Type

PLATE XLI.

- FIG. 1. *Pisaster brevispinus* (Stimpson) Verrill. Type. Dorsal view; about
5% natural size. U. S. Nat. Mus.
- FIG. 2. The same specimen. Actinal view; 5% natural size.



1, 2. *PISASTER BREVISPINUS* (Stimpson) Verrill. Type

PLATE XLII.

Pisaster papulosus Verrill. Type. Dorsal view; about 7/10 natural size.

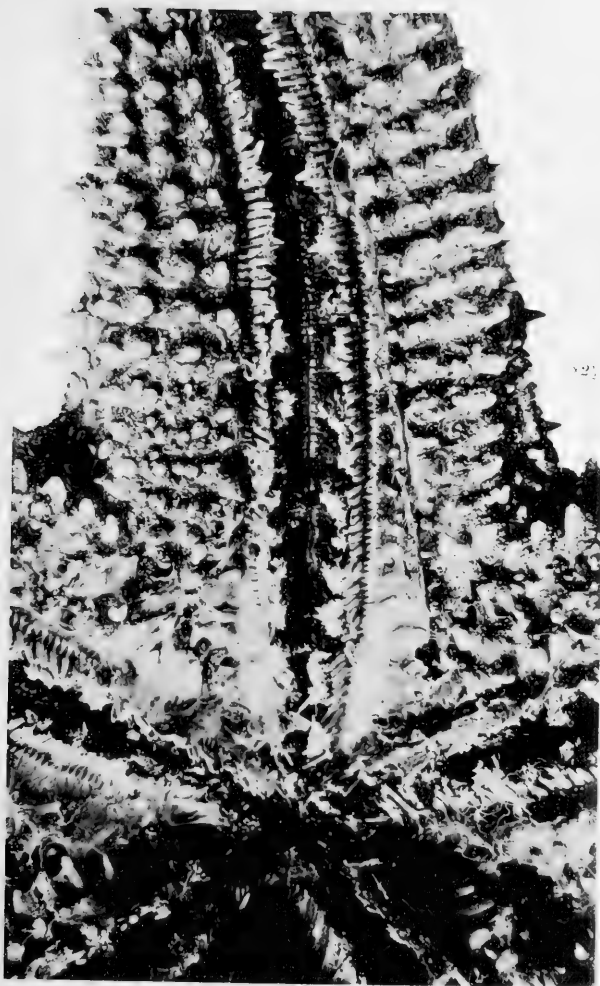


HELIOGRAPH CO., BOSTON

PISASTER PAPULOSUS VER. Type

PLATE XLIII.

Pisaster papulosus Verrill. Actinal side of type; $\times 2\frac{1}{2}$.

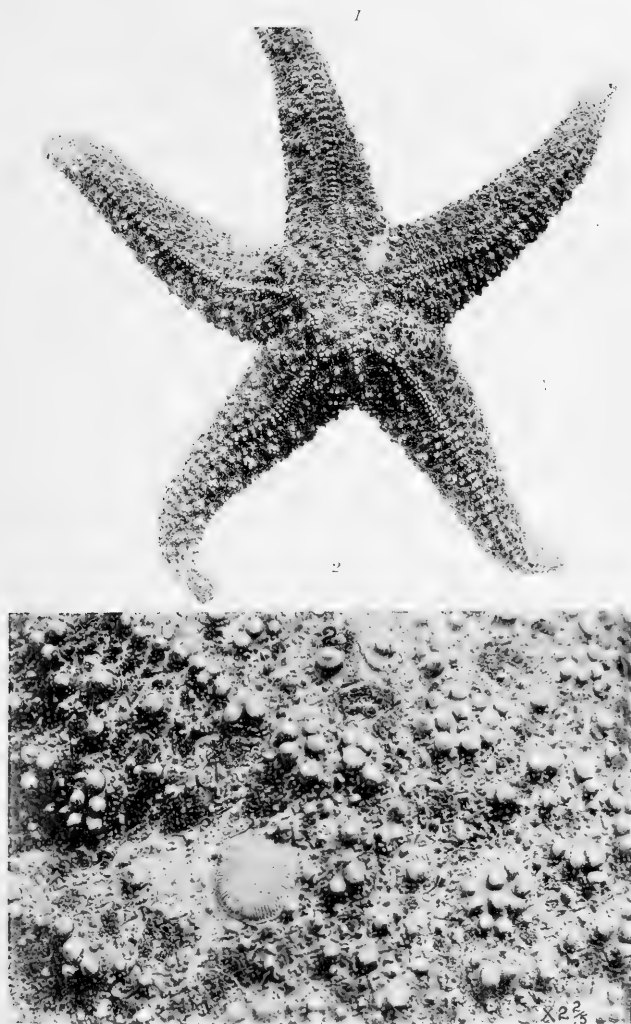


HELIO TYPE CO., BOSTON

PISASTER PAPULOSUS VER. Type

PLATE XLIV.

- FIG. 1. *Pisaster brevispinus* (Stimpson) Verrill. Dorsal view; about $\frac{1}{2}$ natural size. No. 1820, Mus. Comp. Zool.
- FIG. 2. The same specimen. Dorsal view of a part of the disk, including the madreporic plate; $\times 2\frac{1}{2}$.

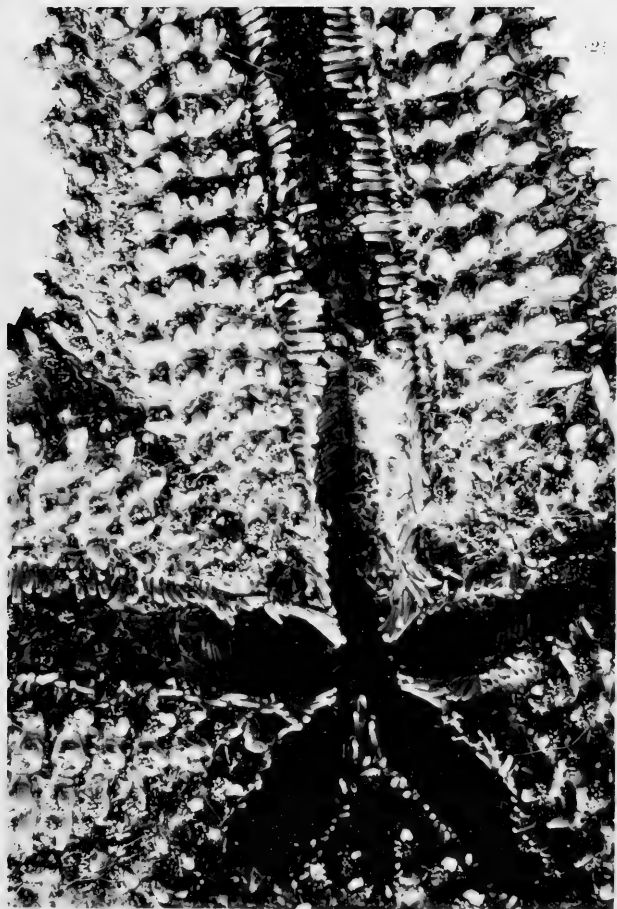


HELIOTYPE CO., BOSTON

1,2. *PISASTER BREVISPINUS* (ST.) VER.

PLATE XLV.

Pisaster brevispinus (Stimpson) Verrill. Actinal side; $\times 2\frac{2}{5}$. No. 1820, Mus.
Comp. Zoölogy.

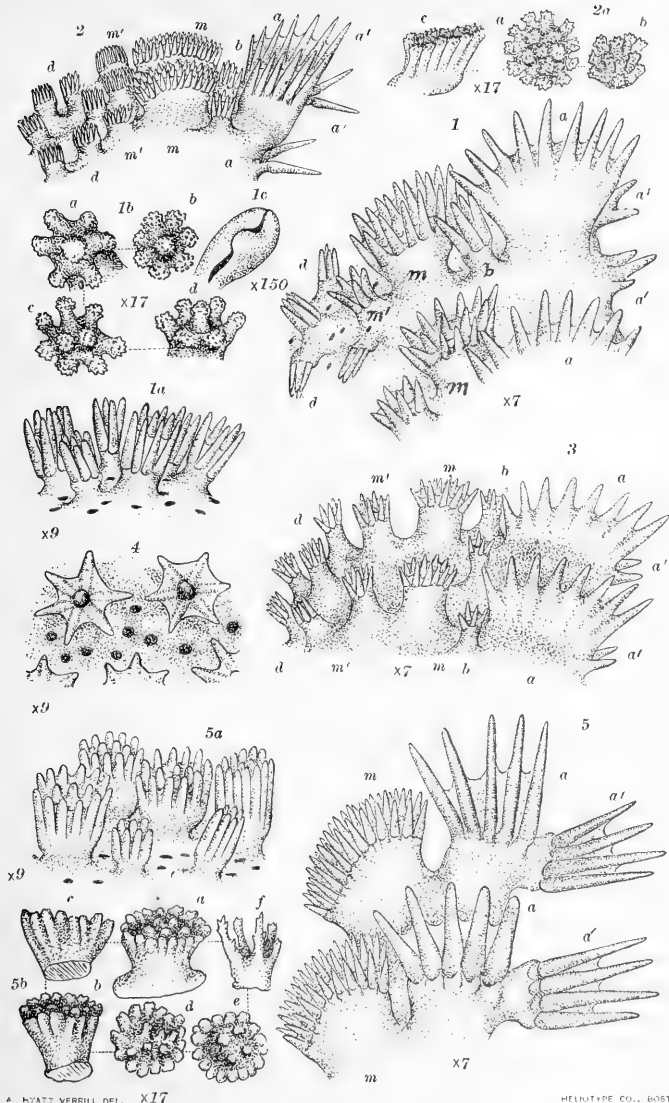


HELIOTYPE CO., BOSTON

PISASTER BREVISPINUS (ST.) VER.

PLATE XLVI.

- FIG. 1. *Solaster stimpsoni* Verrill. Profile view of adambulacral, marginal, and adjacent spines; *a*, *a*, adambulacral spines, actinal series; *a'*, *a'*, furrow series; *b*, peractinals; *m*, *m*, inferomarginals; *m'*, supramarginals; *d*, dorso-lateral spines and plates.
- FIG. 1a. The same specimen. A group of dorsal pseudopaxillæ and papular pores; \times about 9.
- FIG. 1b. The same specimen. Dorsal pseudopaxillæ from base of ray, vertical and side views; \times 17.
- FIG. 1c. The same specimen. A dorsal, dermal, bivalve pedicellaria from near the edge of a papular pore; \times 150.
- FIG. 2. *Solaster galaxides* Verrill. Type. Profile view of actinal side; *a*, *a*, plates; \times about 7. Lettering as in fig. 1.
- FIG. 2a. The same. A group of dorsal pseudopaxillæ from another specimen; \times about 17. No. 1897, Mus. Comp. Zool.
- FIG. 3. *Solaster constellatus* Verrill. Type. \times about 7. Lettering as in fig. 1.
- FIG. 4. The same specimen. A group of dorsal pseudopaxillæ and papular pores, seen from above; \times about 9.
- FIG. 5. *Solaster dawsoni* Verrill. Type. Profile view of adambulacral and inferomarginal plates and spines from middle part of a ray. Lettering as in fig. 1.
- FIG. 5a. The same specimen. A group of dorsal pseudopaxillæ and papular pores; \times 9.
- FIG. 5b. The same. Dorsal pseudopaxillæ from the type specimen, vertical and side views; \times 17.



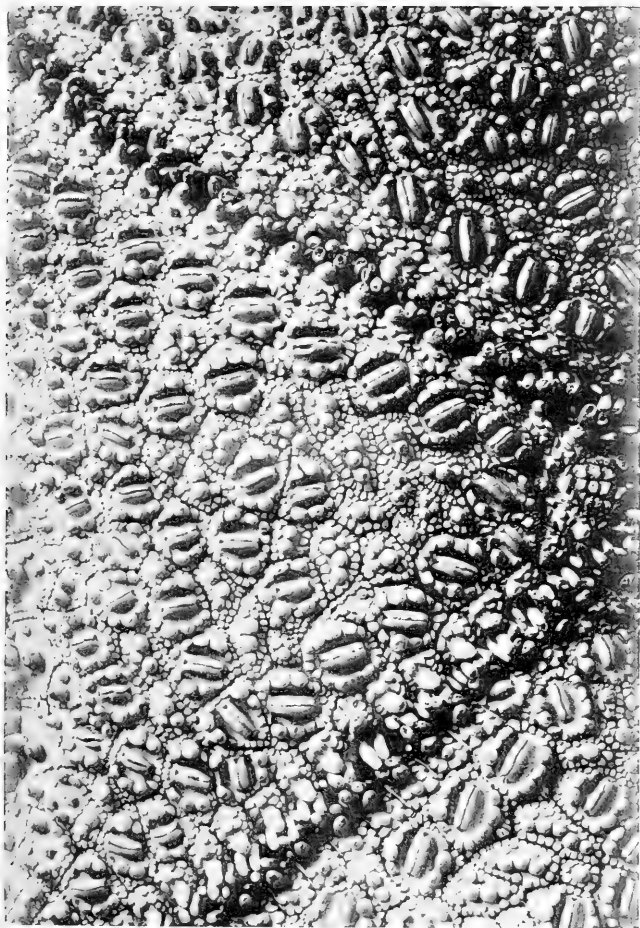
A. HYATT VERRILL DEL. X17

HELIOTYPE CO., BOSTON

1-1c. *SOLASTER STIMPSONI* VER. Details
 2.2a. *S. GALAXIDES* VER. Details. Type
 3-4. *S. CONSTELLATUS* VER. Details. Type
 5-5b. *S. DAWSONI* VER. Details

PLATE XLVII.

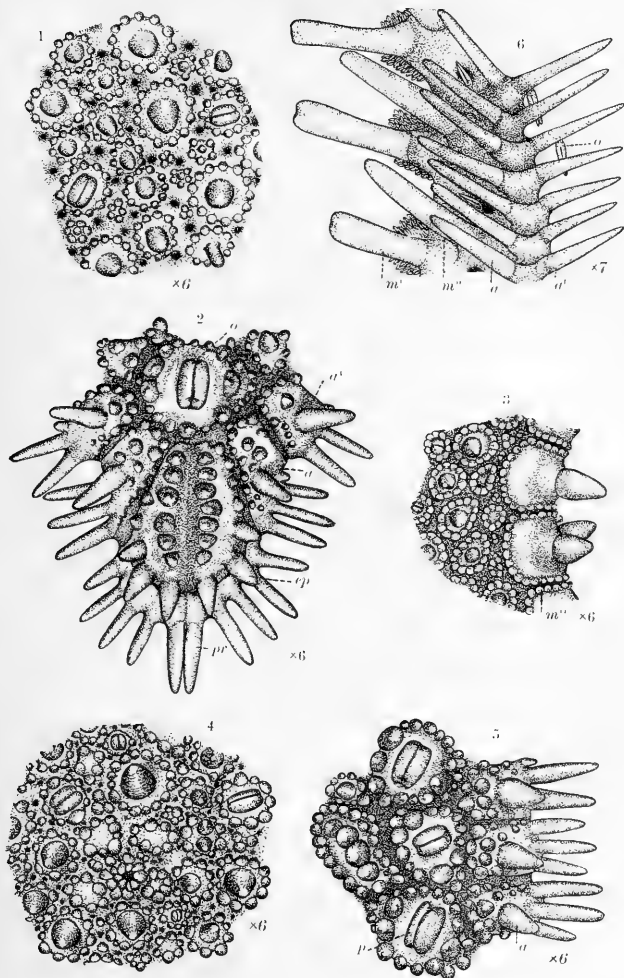
FIG. 1. *Hippasteria phrygiana* (Parel.) Agassiz. Photograph of under side of an Atlantic specimen; enlarged.



HIPPASTERIA PHRYGIANA (Parel.) Agassiz photograph of under side of an Atlantic specimen enlarged

PLATE XLVIII.

- FIG. 1. *Hippasteria phrygiana* (Parel.) Agassiz. Part of the dorsal surface of a New England specimen (314); $\times 6$.
- FIG. 2. The same. One of the jaws and adoral plates; *a*, *a'*, first and second adambulacral plates; *ep*, epioral spines; *pr*, apical peroral spines; *o*, large valvular pedicellaria on first actinal interradiial plate; $\times 6$.
- FIG. 3. The same. Two inferomarginal plates (*m''*) and adjacent interactinals; $\times 6$.
- FIG. 4. The same. Central part of disk, showing dorsal "anal" or nephridial pore; $\times 6$.
- FIG. 5. The same. Three adambulacral plates and spines (*a*) and adjacent interactinal plates, each bearing a large valvular pedicellaria; $\times 6$.
- FIG. 6. *Orthasterias tanneri* Verrill. *a*, outer, and *a'*, inner adambulacral spines; *m'*, supramarginals, and *m''*, inferomarginals; *o*, one of the large, acute major pedicellariæ; $\times 7$. From off the Atlantic coast. No. 5524. Yale Mus.



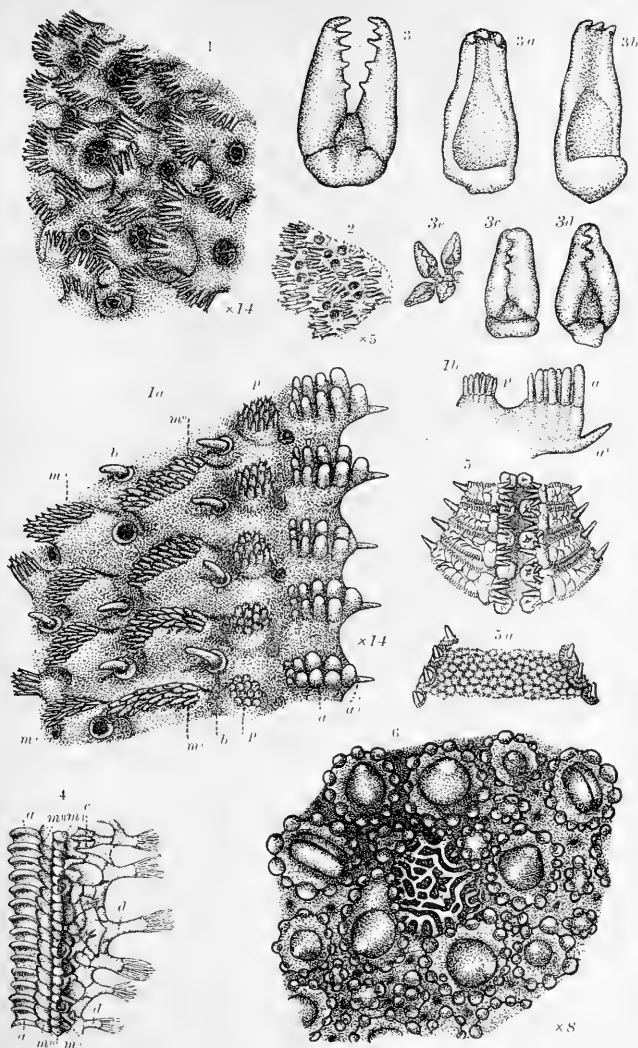
A. H. VERRILL, FROM NATURE.

HELIOTYPE CO.

1-5. HIPPIASTERIA PHRYGIANA (Parel.) Agassiz
6. ORTHASTERIAS TANNERI Verrill

PLATE XLIX.

- FIG. 1. *Henricia sanguinolenta*, var. *pectinata* Verrill. Type. From an Atlantic specimen. Part of the dorsal surface; $\times 14$.
- FIG. 1a. The same specimen. Part of under surface and side of a ray; *a*, adambulacral spines; *a'*, inner or groove-spine; *p*, *p*, peractinal row of pseudopaxillæ; *m'*, *m'*, supramarginals; *m''*, *m''*, inferomarginals; *b*, *b*, papulæ; $\times 14$.
- FIG. 1b. The same. Profile view of one interambulacral and one peractinal group of spines; $\times 14$.
- FIG. 2. *Henricia sanguinolenta* (Müll.) Bell. Young. Atlantic specimen. Altered from Duncan and Sladen, $\times 5$.
- FIGS. 3-3e. Major or forficulate pedicellariæ of *Pisaster ochraceus*, much enlarged; 3, profile view of one of the larger erect, unguiculate, lateral kind; 3a, 3b, interior surface of valves; 3c, 3d, two of the smaller forms; 3e, a small group of the small pedicellate forms found on the margin of the adambulacral plates.
- FIG. 4. *Crossaster papposus* (Linn.) M. & Tr. Part of the skeleton of a ray, of an Arctic specimen, after Danielssen and Koren; *a*, *a*, adambulacral plates; *m'*, *m'*, superomarginals; *m''*, *m''*, inferomarginals; *c*, connective ossicle; *d*, dorsal plates and pseudopaxillæ; enlarged.
- FIG. 5. *Ctenodiscus crispatus* (Retz.) D. & Kor. From an Atlantic specimen, after Müller and Troschel. Under side of base of a ray.
- FIG. 5a. The same. Part of the dorsal surface. \times about 2.
- FIG. 6. *Hippasteria phrygiana*. Part of disk, showing madreporic plate; $\times 8$.



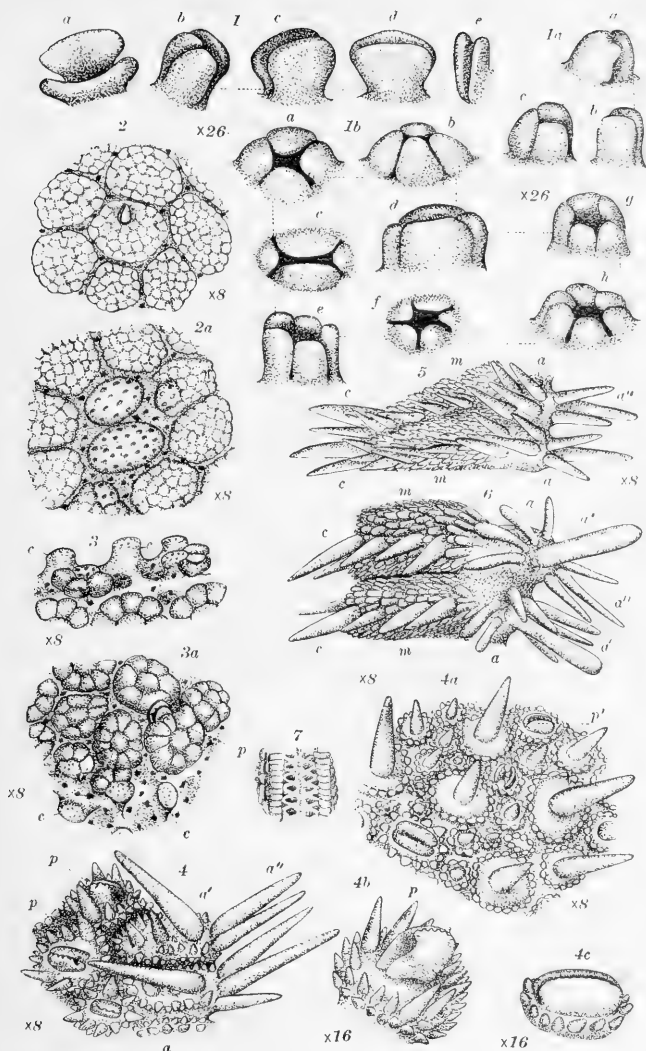
A. M. VERRILL, FROM NATURE.

HELIOTYPE CO.

- 1-1a. *HENRICIA SANGUINOLENTA*, var. *PECTINATA* Verrill
 2. *HENRICIA SANGUINOLENTA* (Müll.) Bell
 3-3e. *PISASTER OCHRACEUS* (Brandt)
 4. *CROSSASTER PAPPOSUS* (Linn.) M. & Tr.
 5-5a. *CTENODISCUS CRISPATUS* (Retz.) D. & Kor.
 6. *HIPPASTERIA PHRYGIANA* (Parel.) Agassiz

PLATE L.

- FIG. 1. *Dermasterias imbricata* (Grube) Perrier. *a, c*, pedicellariæ, mostly bivalved, from actinal side; $\times 26$.
- FIG. 1a. The same specimen. *a-c*, bivalved and trivalved pedicellariæ from the actinal side; $\times 26$.
- FIG. 1b. The same specimen. *a-f*, four-valved and five-valved pedicellariæ from the dorsal side; $\times 26$.
- FIG. 2. *Ceramaster granularis* (Retz.) Verrill. Plates of the dorsal side covered with granules; the central one bears a bivalved pedicellaria; $\times 8$.
- FIG. 2a. The same specimen, with the granules removed from two of the plates; $\times 8$.
- FIG. 3. *Tosiaster arcticus* Verrill. Type. A group of dorsal plates, partially in profile; some of them (*c, c*) with the large granules removed; also showing papular pores; $\times 8$.
- FIG. 3a. The same specimen. A group of dorsal plates, some of them (*c, c*) with the granules removed; *p*, bivalved pedicellariæ; $\times 8$.
- FIG. 4. *Hippasteria spinosa* Verrill. Type. *a', a'* inner, and *a*, outer adambulacral spines; *p, p'*, pedicellariæ of actinal plates; $\times 8$.
- FIG. 4a. The same specimen. A group of dorsal plates and spines; *p, p*, pedicellariæ; $\times 8$.
- FIG. 4b. The same specimen. One of the dorsal plates with a pedicellaria; \times about 16.
- FIG. 4c. The same. A dorsal pedicellaria of the broad form; \times about 16.
- FIG. 5. *Astropecten californicus* Fisher. Actinal side; *a', a'*, inner, and *a, a*, outer adambulacral spines; *m, m*, inferomarginal plates; *c, c*, inferomarginal spines; $\times 8$.
- FIG. 6. *Astropecten sidereal* Verrill. Actinal side; *a, a*, outer adambulacral spines; *a'*, central spine of the adambulacral plate; *a''*, furrow spines; *c, c*, inferomarginal spines; *m, m*, inferomarginal plates; $\times 8$.
- FIG. 7. *Stenasterias macropora* Verrill. Type. Portion of the actinal side of a ray, with the spines removed; $\times 5$.



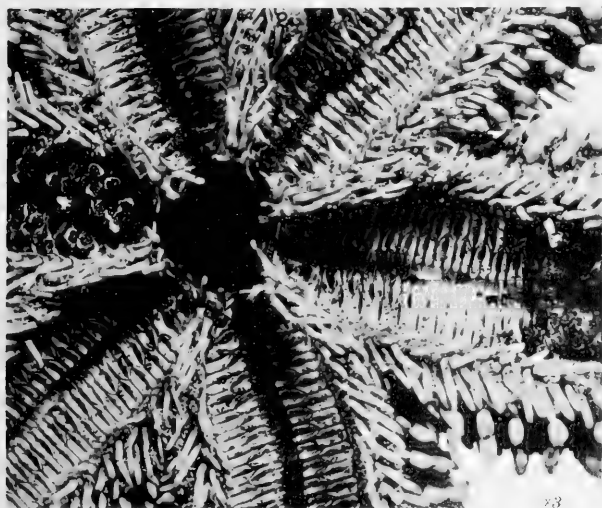
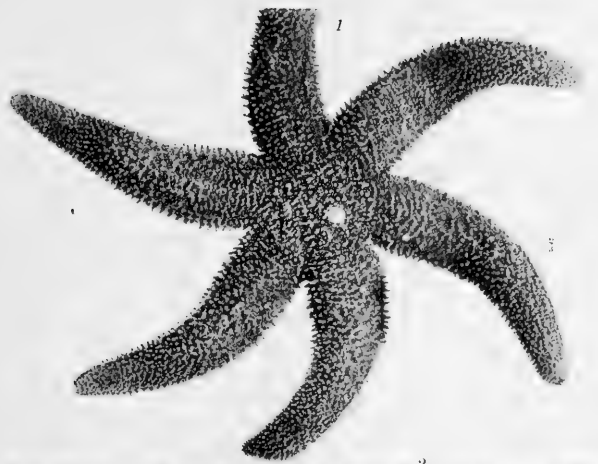
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-1b. *DERMASTERIAS IMBRICATA* (GRUBE)2.2a. *CERAMASTER GRANULARIS* (M.)3.3a. *TOSIASTER ARCTICUS* VER.4-4c. *HIPPASTERIA SPINOSA* VER.5. *ASTROPECTEN CALIFORNICUS* F. 6. *A. SIDEREALIS* VER.7. *STENASTERIAS MACROPORA* VER.

PLATE LI.

- FIG. 1. *Asterias katherinæ* Gray. Dorsal view of No. 1181, Mus. Comp. Zoöl.;
2/3 natural size. Gulf of Georgia.
- FIG. 2. The same specimen. Actinal side; $\times 3$.

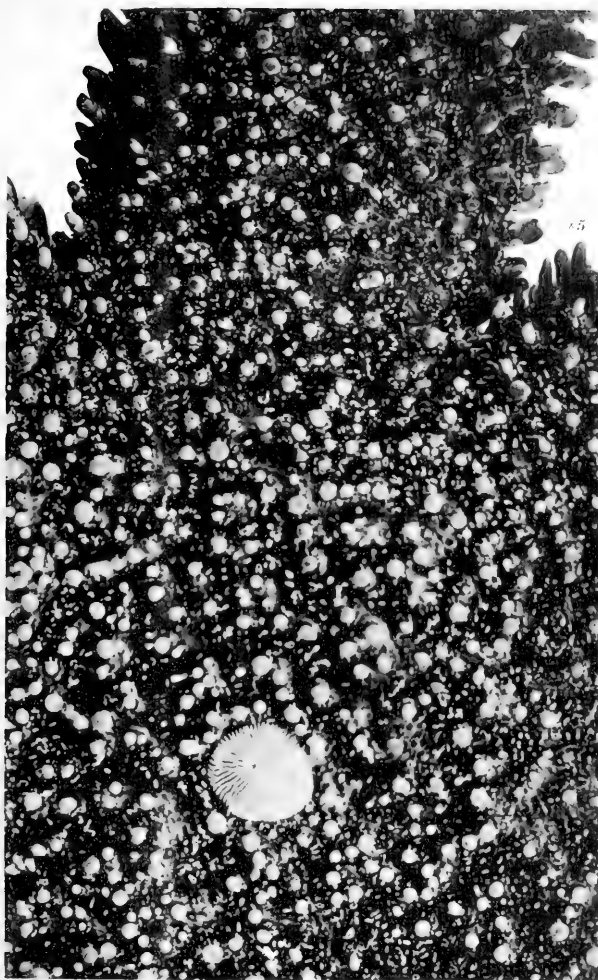


HELIOTYPE CO., BOSTON

1,2. *ASTERIAS KATHERINAE* GRAY

PLATE LII.

Asterias katherinæ Gray. Dorsal side of the same specimen shown on pl. LI;
× 4¾. Gulf of Georgia. No. 1181, Mus. Comp. Zool.



HELIOTYPE CO., BOSTON

ASTERIAS KATHERINAE GRAY

PLATE LIII.

FIG. 1. *Asterias victoriana* Verrill. Type. Dorsal view; $\frac{3}{4}$ natural size.

FIG. 2. *Pisaster confertus* (Stimpson) Verrill. \times about $1\frac{1}{8}$.



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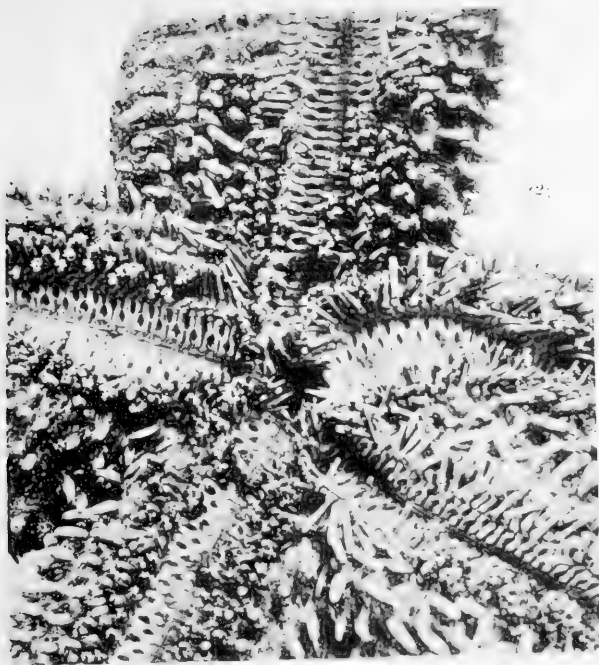
1. *ASTERIAS VICTORIANA* VER. Type
2. *PISASTER CONFERTUS* (St.)

PLATE LIV.

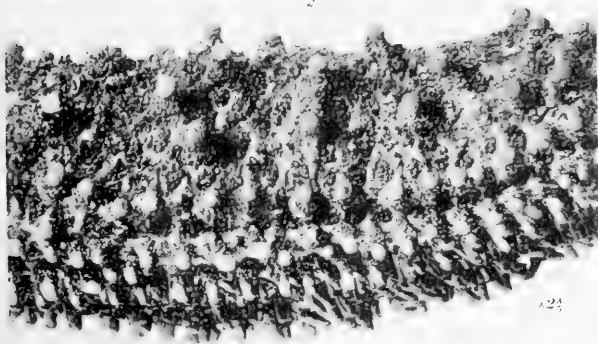
FIG. 1. *Asterias victoriana* Verrill. Type. Actinal side; $\times 2\frac{1}{3}$.

FIG. 2. The same specimen. Side view of a ray; $\times 2\frac{3}{4}$. Vancouver I.

1



2



HELIOGRAPH CO., BOSTON

1.2. ASTERIAS VICTORIANA VER. Type

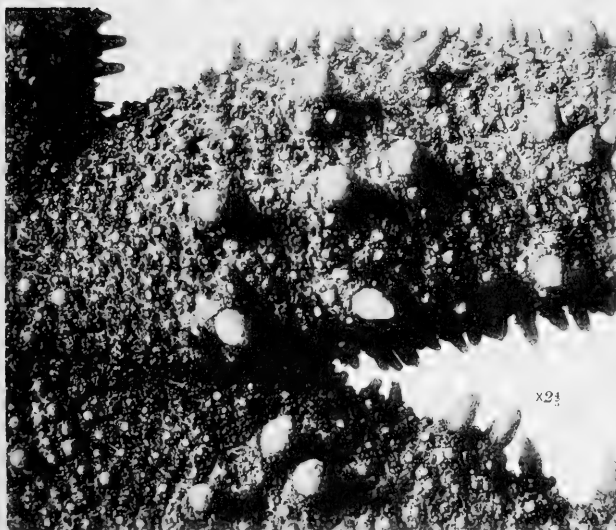
PLATE LV.

- FIG. 1. *Asterias polythela* Verrill. Type. Dorsal side; about $\frac{2}{3}$ natural size.
FIG. 2. The same specimen. Part of dorsal side; $\times 2\frac{1}{2}$. No. 5820.

1



2

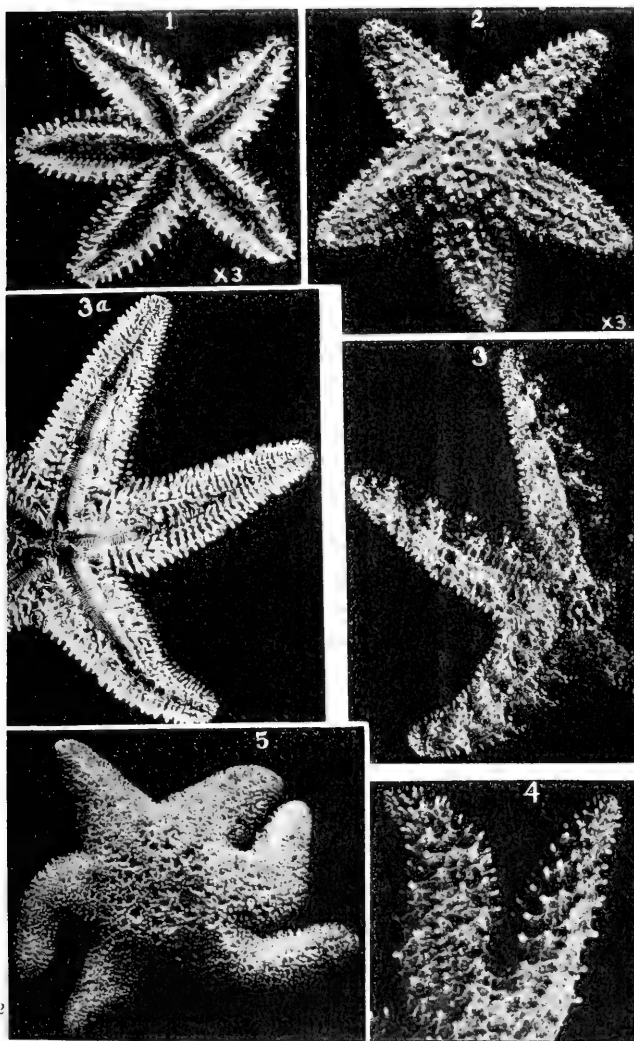


HELIO TYPE CO., BOSTON

1, 2. *ARTERIAS POLYTHIELA* VER. Type

PLATE LVI.

- FIGS. 1, 2. *Leptasterias arctica* (Murdoch) (?). Young. Actinal and dorsal views of specimens from Bering Sea; $\times 3$. No. 16591, U. S. Nat. Mus.
- FIGS. 3, 3a. *Pisaster ochraceus*, var. *nodiferus* Verrill. Dorsal and actinal views; about $\frac{2}{3}$ natural size (*nodosus* on plate incorrect).
- FIG. 4. *P. capitatus* (Stimpson) Verrill. Dorsal side of two rays; about $\frac{2}{3}$ natural size.
- FIG. 5. *Leptasterias aequalis* (Stimpson), var. *compacta* Verrill. Type. Dorsal side; $\times 2$. Yale Mus.



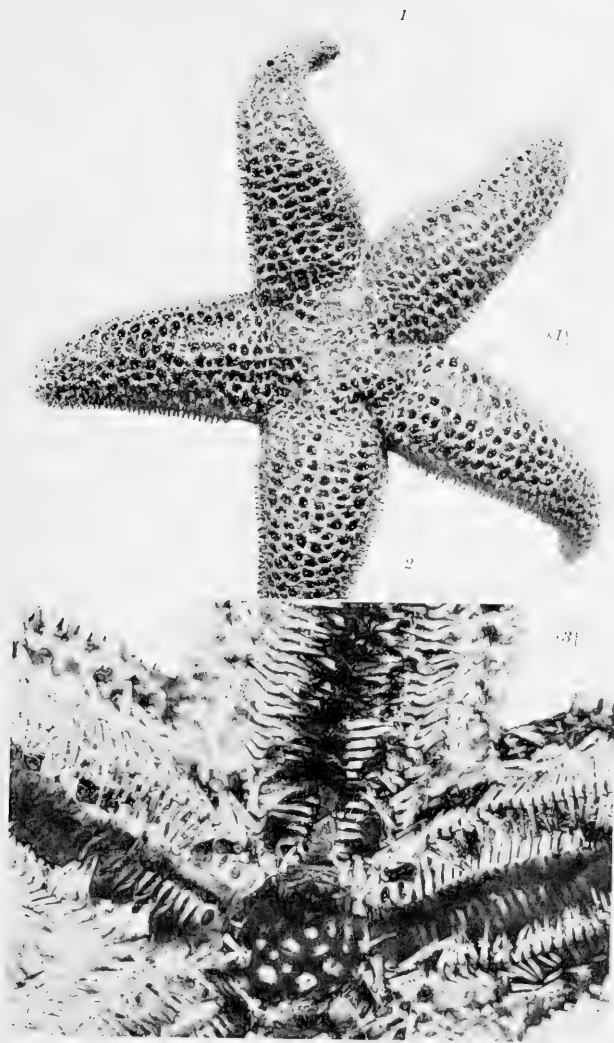
HELIOTYPE CO., BOSTON

- 1, 2. *LEPTASTERIAS ARCTICA* (MUR.) YOUNG
- 3, 3a. *PISASTER OCHRACEUS NODOSUS* VER.
4. *PISASTER CAPITATUS* (ST.)
5. *LEPTASTERIAS AEQUALIS COMPACTA* VER.

PLATE LVII.

FIG. 1. *Parasterias albertensis* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$.

FIG. 2. The same specimen. Actinal side; $\times 3\frac{3}{4}$.



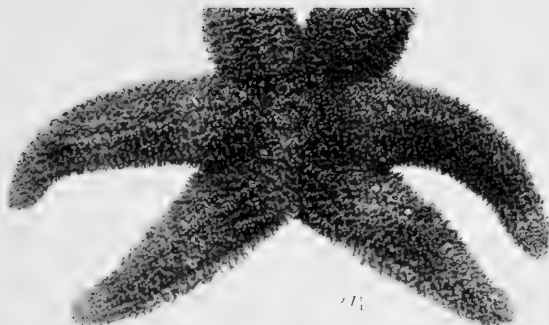
HELIOTYPE CO., BOSTON

1.2. PARASTERIAS ALBERTENSIS VER. Type

PLATE LVIII.

- FIG. 1. *Leptasterias epichlora*, var. *plena* Verrill. Type. Dorsal view;
× 1¼. Vancouver I.
FIG. 2. *Asterias multiclava* Verrill. Type. About ¾ natural size.

1



1/1

2



2/1

HELIOTYPE CO., BOSTON

1. *LEPTASTERIAS EPICHLORA PLENA* VER. Type
2. *ASTERIAS MULTICLAVA* VER. Type

PLATE LIX.

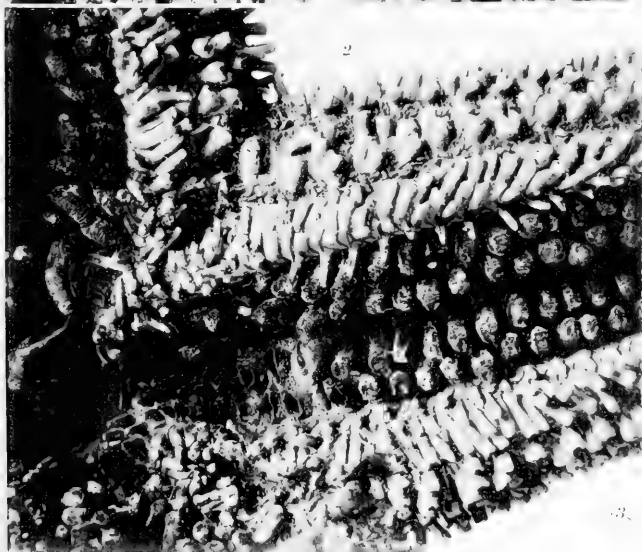
FIG. 1. *Asterias multiclava* Verrill. Type. Actinal side; $\times 2\frac{3}{4}$. Bering I.
No. 15841, U. S. Nat. Mus.

FIG. 2. *Allasterias anomala* Verrill. Type. Actinal side; $\times 3\frac{7}{8}$. Arctic
Alaska (L. M. Turner, 1874). No. 3821, U. S. Nat. Mus.

1



2

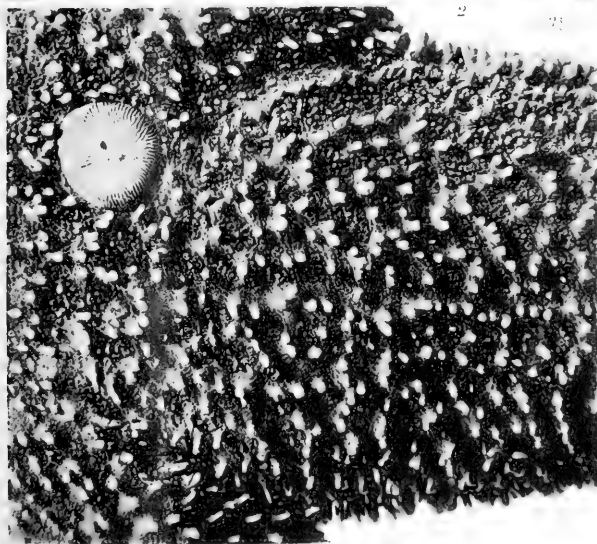


HELIOTYPE CO., BOSTON

1. *ASTERIAS MULTICLAVA* VER. Type
2. *ALLASTERIAS ANOMALA* VER. Type

PLATE LX.

- FIG. 1. *Pisaster papulosus* Verrill. Cotype. Side view of a ray, near base;
× about 3. Vancouver I.
- FIG. 2. *Allasterias anomala* Verrill. Type. Dorsal view; × $3\frac{3}{8}$. St.
Michael's I., Arctic Alaska (L. M. Turner). No. 3821, U. S. Nat.
Mus.

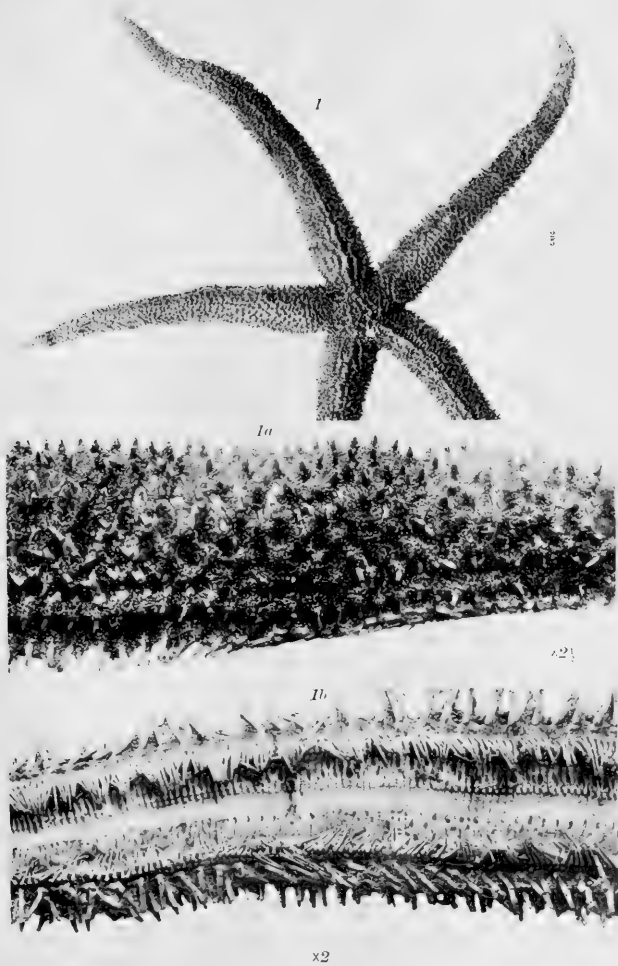


HELIOTYPE CO., BOSTON

1. *PISASTER PAPULOSUS* VER.
2. *ALLASTERIAS ANOMALA* VER. Type

PLATE LXI.

- FIG. 1. *Asterias nanimensis* Verrill. Type. Dorsal side; about $\frac{2}{3}$ natural size. Vancouver I. Canadian Geol. Survey.
- FIG. 1a. The same specimen. Side view of a ray; $\times 2\frac{1}{2}$.
- FIG. 1b. The same specimen. Actinal side of a ray; $\times 2$.



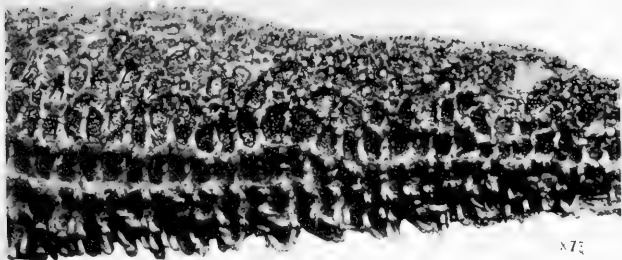
HELIOTYPE CO., BOSTON

1.1b. *ASTERIAS MANIMENSIS* VER. Type

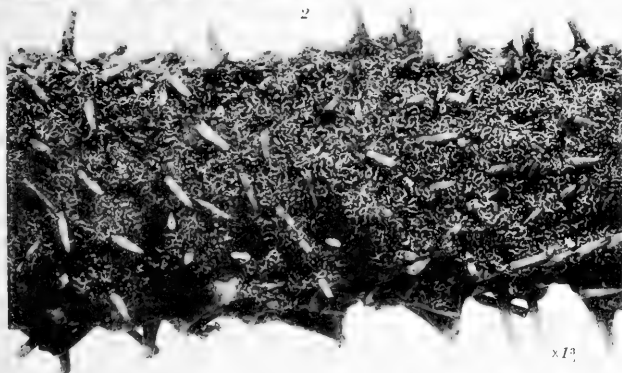
PLATE LXII.

- FIG. 1. *Evasterias troschelii*, var. *alveolata* Verrill. Type. Side view of a ray; $\times 1\frac{1}{8}$.
- FIG. 2. *Orthasterias forreri forcipulata* Verrill. Type. Dorsal view of a ray; $\times 1\%$. Vancouver I.
- FIG. 3. The same specimen. Actinal side of a ray; $\times 1\%$.

7



2



3



HELIOTYPE CO., BOSTON

1. *EVASTERIAS TROSCHELI ALVEOLATA* VER. Type
- 2,3. *ORTHASTERIAS FORRKERI FORCIPULATA* VER. Type



PLATE LXIII.

FIG. 1. *Orthasterias biordinata* Verrill. Type. About $\frac{7}{8}$ natural size.

FIG. 2. The same specimen. Actinal side; $\frac{7}{8}$ natural size.

1



2



HELIOTYPE CO., BOSTON

1.2. ORTHASTERIAS BIORDINATA VER. Type

PLATE LXIV.

- FIG. 1. *Orthasterias leptolena* Verrill. Type. Actinal side; about $\frac{7}{8}$ natural size. Canadian Geol. Survey.
- FIG. 1a. The same specimen. Dorsal side; $\frac{7}{8}$ natural size.
- FIG. 2. The same. A young specimen. Actinal side; $\frac{9}{10}$ natural size.
- FIG. 2a. The same specimen. Dorsal side; $\frac{9}{10}$ natural size. One ray is lost.



PLATE LXV.

- FIG. 1. *Orthasterias forreri* (de Loriol) Verrill. Dorsal side; about $\frac{4}{5}$ natural size. No. 1823, Mus. Comp. Zoölogy.
- FIG. 2. *Orthasterias columbiana* Verrill. Young. Dorsal side; about natural size.



HELIOTYPE CO., BOSTON

1. ORTHASTERIAS FORRERI (LOR.)
2. O. COLUMBIANA VER. YOUNG

PLATE LXVI.

- FIG. 1. *Orthasterias forreri* (Loriol) Verrill. Dorsal view of disk and base of ray; *P*, major pedicellaria; $\times 3\%$. No. 1823.
- FIG. 2. The same specimen. Actinal side; $\times 3\frac{2}{3}$. No. 1823, Mus. Comp. Zool.

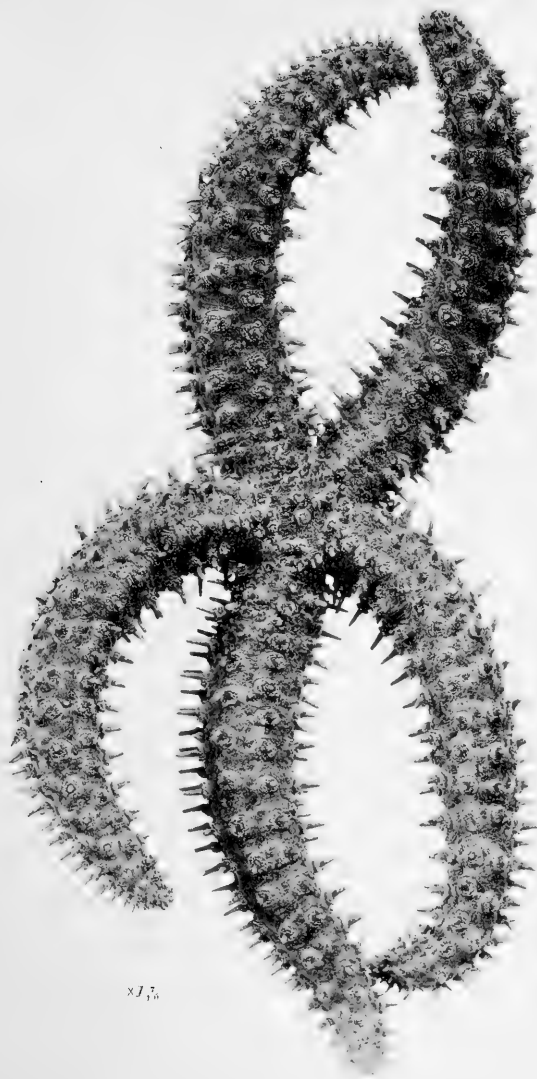


HELIOTYPE CO., BOSTON

1,2. ORTHASTERIAS FORKERI (LOR.)

PLATE LXVII.

Orthasterias gonolena Verrill. Dorsal view; $\times 1\frac{1}{2}$. Off San Francisco. Yale Mus.



XJ $\frac{7}{15}$

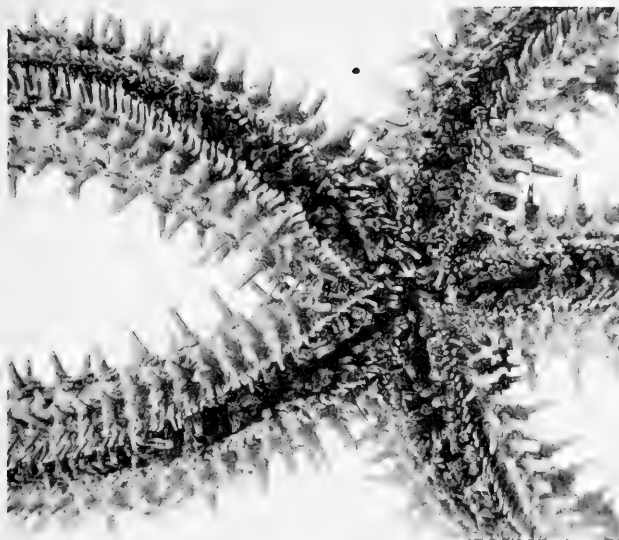
HELIOTYPE CO., BOSTON.

ORTHASTERIAS CONOLEA VER

PLATE LXVIII.

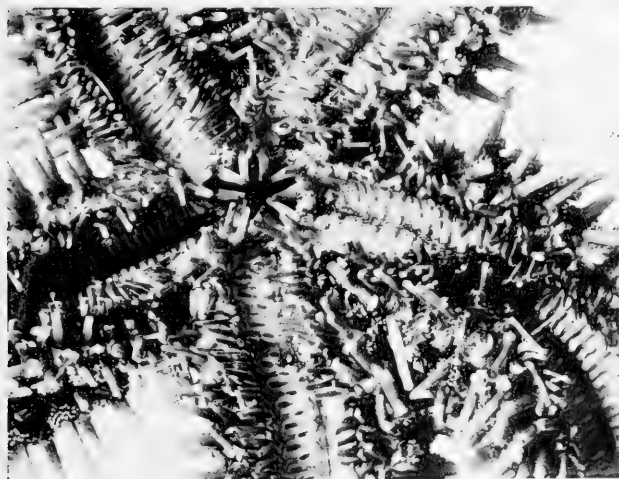
- FIG. 1. *Orthasterias gonolena* Verrill. Ventral view of the same specimen as in pl. LXVII; $\times 2\frac{1}{2}$.
FIG. 2. *Orthasterias californica* Verrill. Type. Actinal side; $\times 3\frac{1}{8}$.

1



2

2



23

HEPSTEADT CO., BOSTON

1. *ORTHASTERIAS GONOLENA* VER.
2. *O. CALIFORNICA* VER. Type

PLATE LXIX.

- FIG. 1. *Asterias multiclava* Verrill. Type. Portion of the actinal side of a ray; \times about $4\frac{1}{2}$.
- FIG. 2. *Orthasterias gonolena* Verrill. Portion of the actinal side of a ray; \times 4.
- FIG. 3. *Pisaster brevispinus* (Stimpson) Verrill. Portion of actinal side of a ray; \times 3.
- FIG. 4. *Asterias victoriana* Verrill. Type. Portion of the actinal side of a ray; \times $2\frac{2}{3}$.
- FIG. 5. *Allasterias anomala* Verrill. Type. Portion of the actinal side of a ray; \times $5\frac{1}{6}$. St. Michael, Alaska (L. M. Turner, 1874).

1

2

x4 $\frac{1}{2}$

x4

3

x3

4

x2 $\frac{1}{2}$

5

x1

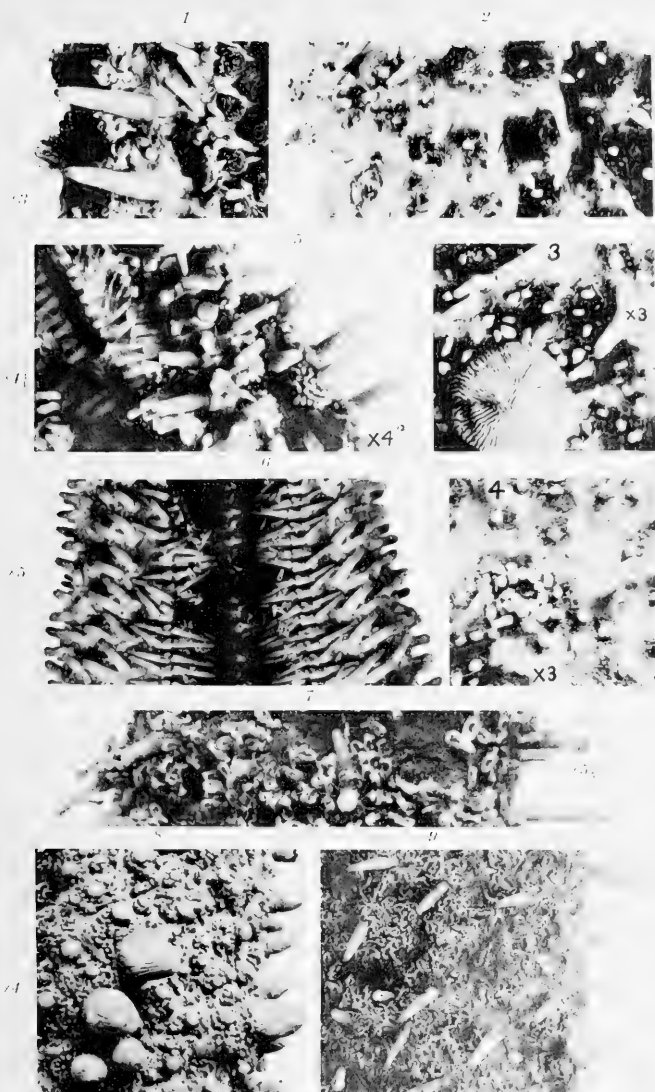
HELIOTYPE CO., BOSTON

1. *ASTERIAS MULTICLAVA* VER. Type
2. *ORTHASTERIAS GONOLENA* VER.
3. *PISASTER BREVISPINUS* (ST.)
4. *ASTERIAS VICTORIANA* VER.
5. *ALLASTERIAS ANOMALA* VER. Type



PLATE LXX.

- FIG. 1. *Urasterias linckii* (Müller and Troschel) Verrill. Portion of the actinal side of a ray of a North Atlantic specimen; $\times 3$.
- FIG. 2. The same specimen. Portion of the dorsal side of a ray; $\times 3$.
- FIG. 3. The same specimen. Madreporite with surrounding pedicellariæ and spines; $\times 3$.
- FIG. 4. The same specimen. Nephridial pore or so-called "anal pore" and surrounding pedicellariæ; $\times 3$.
- FIG. 5. *Orthasterias californica* Verrill. Type. Portion of the actinal side of a ray; $\times 4\frac{3}{4}$.
- FIG. 6. *Parasterias albertensis* Verrill. Type. Portion of the actinal side of a ray; $\times 5$. British Columbia. Yale Mus.
- FIG. 7. *Orthasterias forreri* (Loriol) Verrill. Type. Portion of the dorsal side of a ray, showing the very large minor pedicellariæ; $\times 5\frac{1}{2}$.
- FIG. 8. *Asterias polythela* Verrill. Type. Portion of the dorsal side of a ray; $\times 4$. Arctic America; Steamer Corwin. No. 15820.
- FIG. 9. *Orthasterias forreri forcipulata* Verrill. Type. Portion of the side of a ray; $\times 2$.



HOLOTYPE COLLECTION

- 1-1. *URASTERIAS LINCOLNII* (M. & TR.) ATLANTIC
5. *ORTHASTERIAS CALIFORNICA* VERR. Type
6. *PARASTERIAS ALBICOLLIS* VERR. Type
7. *ORTHASTERIAS FORRERI* (LOR.)
8. *ASTERIAS POLYTHELA* VERR. Type
9. *ORTHASTERIAS FORRERI FORCIPULATA* VERR. Type



PLATE LXXI.

- FIG. 1. *Leptasterias arctica* (Murdoch) Verrill. Dorsal side; $\times 1\frac{1}{2}$. No. 1428, Mus. Comp. Zoöl.
- FIG. 2. *L. arctica* (Murdoch). Dorsal side; $\times 1\frac{1}{2}$. Same number. Both from Alaska.



HELIOGRAPH CO., BOSTON

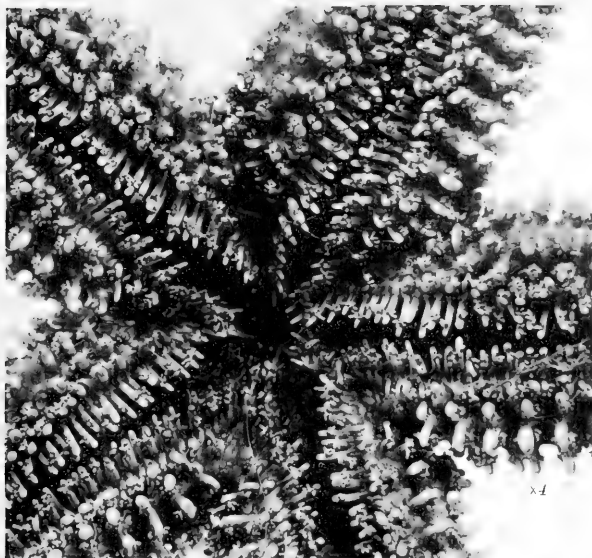
1, 2. LEPTASTERIAS ARCTICA (MUR.)



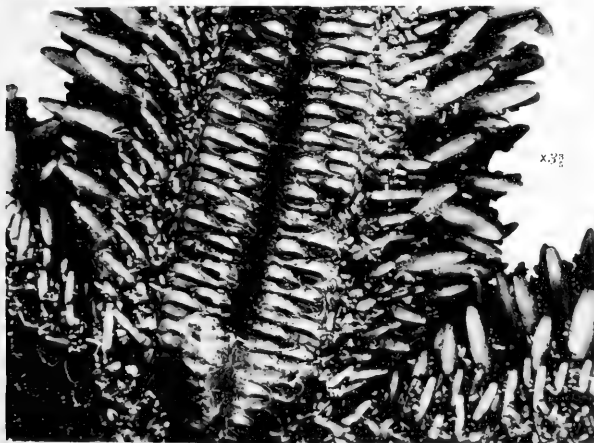
PLATE LXXII.

- FIG. 1. *Leptasterias arctica* (Murdoch). Actinal side; $\times 4$. Alaska.
No. 1428. Mus. Comp. Zool.
- FIG. 2. *Asterias polythela* Verrill. Type. Actinal side; $\times 3\frac{3}{4}$. Arctic Alaska,
Steamer Corwin. No. 15820.

1



2



HELIOTYPE CO., BOSTON

1. LEPTASTERIAS ARCTICA (MUR.)
2. ASTERIAS POLYTHELA VER. Type



PLATE LXXIII.

- FIG. 1. *Pycnopodia helianthoides*. Young, with sixteen rays, showing regular normal mode of interpolation of new rays; 1, odd anterior primary ray; 2, 3, 4, 5, 6, successive pairs of interpolated rays; *a*, odd posterior primary ray; *b*, *b'* and *c*, *c'* second and third pairs of primary posterior rays; \times 2.
- FIG. 2. *Leptasterias inequalis* Verrill. Type. Dorsal side; *a*, ossicles, with spines removed; \times 2.

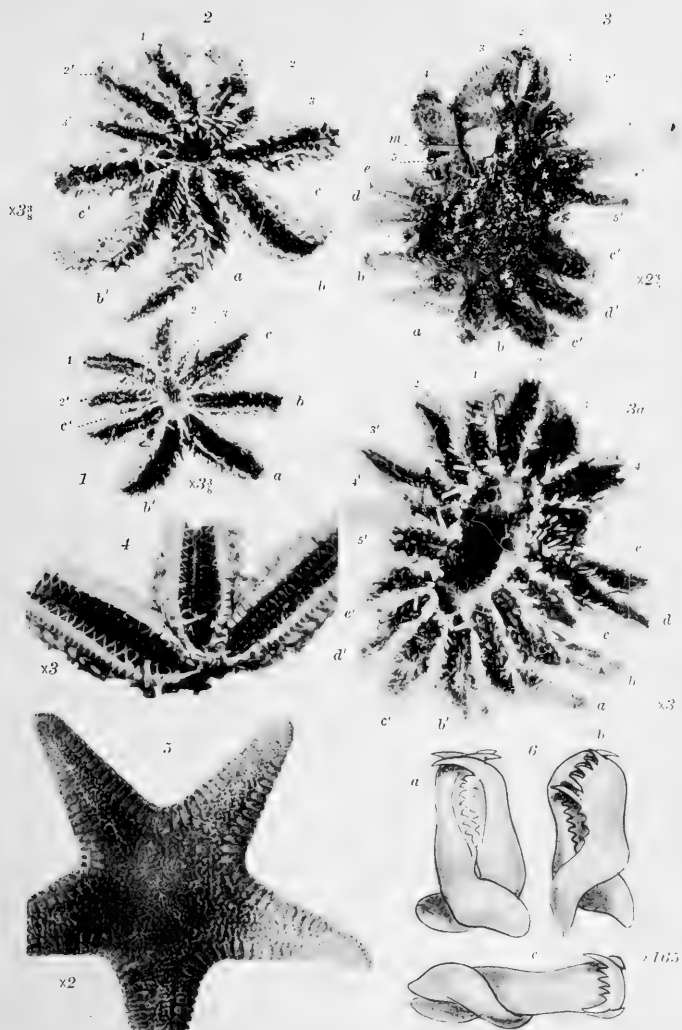


HELIOTYPE CO., BOSTON

1. *PYCNOPODIA HELIANTHOIDES* (BR.) YOUNG
2. *LEPTASTERIAS INEQUALIS* VER. Type

PLATE LXXIV.

- FIG. 1. *Pycnopodia helianthoides*. Very young, with nine rays; 1, odd anterior primary ray; 2, 2', first pair of interpolated rays; 3, small budding ray of second pair; 3', position in which the mate to No. 3 should appear, but no rudiment of it is visible externally; a, odd posterior primary ray; b, b' and c, c', second and third pairs of posterior primary rays; $\times 3\frac{3}{4}$. From Dutch Harbor, Alaska.
- FIG. 2. The same. A somewhat larger specimen with ten rays, in normal order; $\times 3\frac{3}{4}$. Lettering as in fig. 1. From Kadiak.
- FIG. 3. The same. A somewhat larger, abnormal, oblong young specimen with eighteen rays, not all in regular order (see page 200); m, madreporic plate of abnormal size; $\times 2\frac{1}{2}$. Lettering of rays as in fig. 2, with the addition of pairs 4 and 5 anteriorly, and d, d' and e, e' posteriorly. The last two pairs are abnormal; c is an abnormal budding ray. From Kadiak, Alaska.
- FIG. 3a. The same specimen. Actinal side; $\times 3$. Lettering as in fig. 3.
- FIG. 4. *Stenasterias macropora* Verrill. Type. Portion of the actinal side with the spines removed; $\times 3$.
- FIG. 5. *Leptychaster pacificus* Fisher. Dorsal view; \times about 2.
- FIG. 6. *Pycnopodia helianthoides* (Brandt). Minor pedicellariæ; a, b, c, side and profile views; $\times 165$.

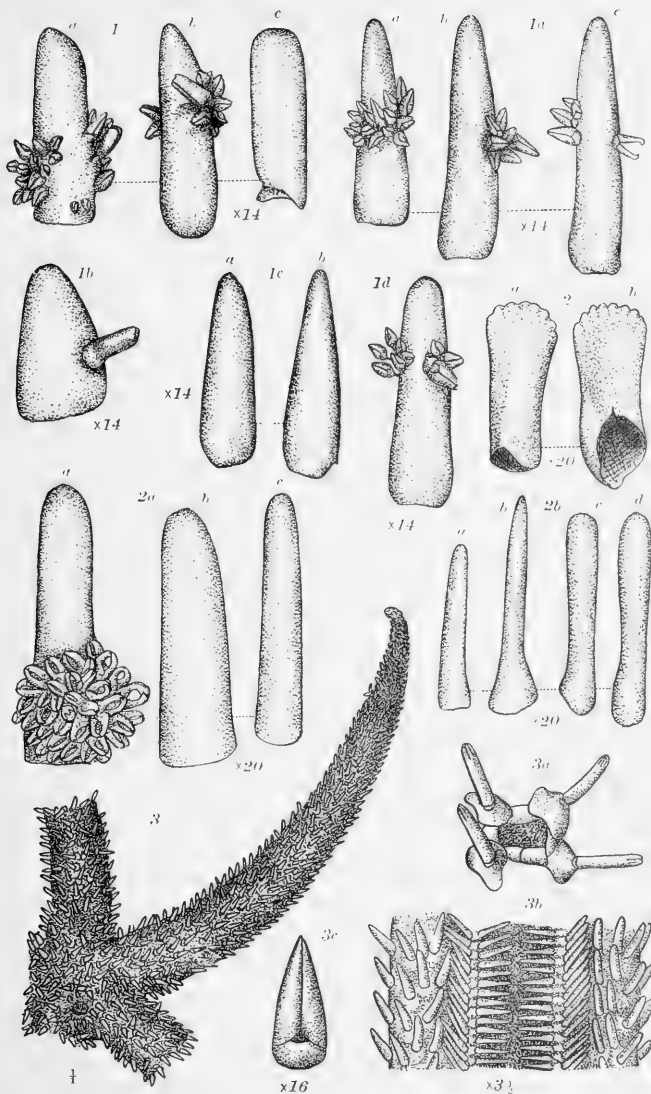


HELIOTYPE CO., BOSTON

- 1-3a. *PYCNOPODIA HELIANTHOIDES* (BR.) YOUNG
 4. *STENASTERIAS MACROPORA* VER.
 5. *LEPTYCHASTER PACIFICUS* FISHER
 6. *P. HELIANTHOIDES* (BR.)

PLATE LXXV.

- FIGS. 1-1d. *Orthasterias merriami* Verrill. Spines and pedicellariæ from No. 1181; 1, *a*, *b*, *c*, and 1c, ordinary dorsal spines; 1a, *a*, *b*, *c*, marginal spines; 1c, adambulacral spines; 1b, a stout dorsal with a major pedicellaria attached; 1d, inferomarginal; \times 14; No. 1181, Mus. Comp. Zool.
- FIGS. 2-2b. *Orthasterias dawsoni* Verrill. Type. Spines and pedicellariæ, \times 20; 2, *a*, *b*, large valves of major pedicellariæ; 2a, dorsal spines; *a*, with wreath of minor pedicellariæ; *b*, *c*, pedicellariæ removed; 2b, adambulacral spines; *a*, *b*, from inner row; *c*, *d*, from outer row.
- FIGS. 3-3c. *Orthasterias koehleri* (de Loriol) Verrill. Type. After de Loriol; 3, part of dorsal side, about natural size; 3a, four dorsal ossicles and spines; 3b, portion of actinal side, \times $3\frac{1}{2}$; 3c, a major pedicellaria; \times 16.



A. HYATT VERRILL DEL.

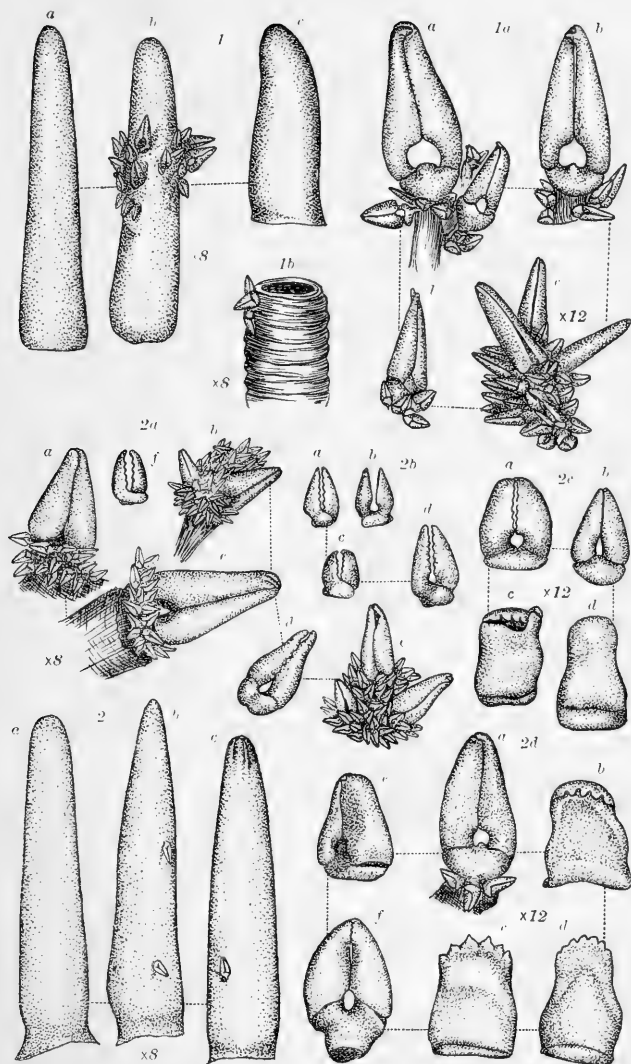
HELIOTYPE CO., BOSTON.

1-1d. *ASTERIAS KATHERINAE* GRAY
 2-2b. *O. DAWSONI* VER. Type
 3-3c. *O. KOEHLERI* (LOR.) Type

PLATE LXXVI.

FIGS. 1-1*b*. *Pisaster brevispinus* (Stimpson). Spines and pedicellariæ of No. 1301, Mus. Comp. Zoöl., Gulf of Georgia, $\times 8$; *a*, *b*, *c*, dorsal spines; 1*a*, *b*, *c*, pedicelled clusters of adambulacral pedicellariæ, from inner edge and within the groove, consisting of both major and minor kinds, of various sizes, attached to a common pedicel; 1*b*, tip of a sucker-foot with pedicellariæ attached.

FIGS. 2-2*d*. *Pisaster papulosus* Verrill. Type. 2, *a*, *b*, *c*, marginal spines; 2*a*, *a-e*, clusters of adambulacral or furrow pedicellariæ attached to a common pedicel and containing both sorts; *f*, a minor pedicellaria much enlarged; 2*b*, *a-d*, minor pedicellariæ more enlarged; 2*c*, *a-d*; and 2*d*, *b-f*, dorsal and lateral large dermal major pedicellariæ of several forms; 2*d*, *a*, is an adambulacral group.



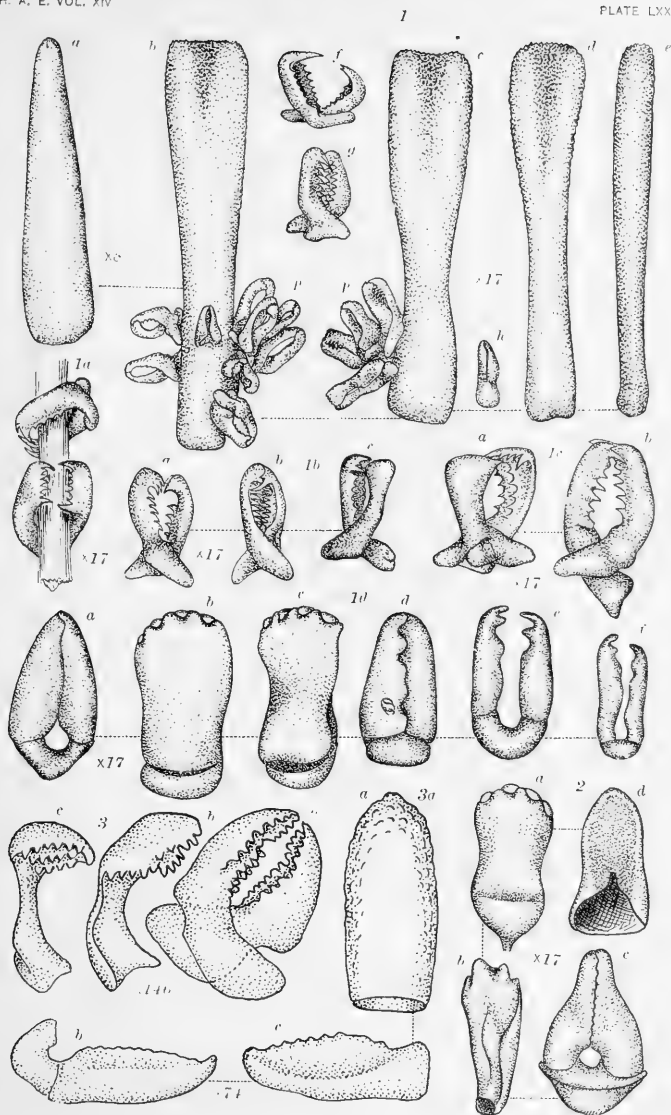
A. HYATT VERRILL DEL.

HELIOTYP CO., BOSTON.

1-1b. *PISASTER PAPULOSUS* VER. VAR.
2-2d. *P. PAPULOSUS* VER. TYPE

PLATE LXXVII.

- FIGS. 1-1d. *Orthasterias forreri* (Loriol) Verrill. Spines and pedicellariæ; 1, *a*, dorsal spine with pedicellariæ removed, $\times 8$; 1, *b*, lower marginal; *c*, upper marginal; *d*, outer adambulacral; *e*, inner adambulacral spine; $\times 17$; *f*, *g*, *h*, some of the detached minor pedicellariæ; 1a, two of the minor pedicellariæ grasping a fiber of hemp from the tangles; 1b, 1c, dermal minor pedicellariæ from the dorsal side, $\times 17$; 1d, a-f, dermal major pedicellariæ from dorsal and lateral areas.
- FIG. 2. *Orthasterias leptolena* Verrill. Type. Major pedicellariæ; a-d, four varieties from the dorsal and lateral areas; $\times 17$.
- FIG. 3. *Allasterias forficulosa* Verrill. Minor pedicellariæ; a, with valves united; b, c, detached valves; $\times 146$.
- FIG. 3a. The same; a, b, c, detached valves of major pedicellariæ; $\times 74$.



A. HYATT VERRILL DEL.

WELCH & CO. BOST. N.

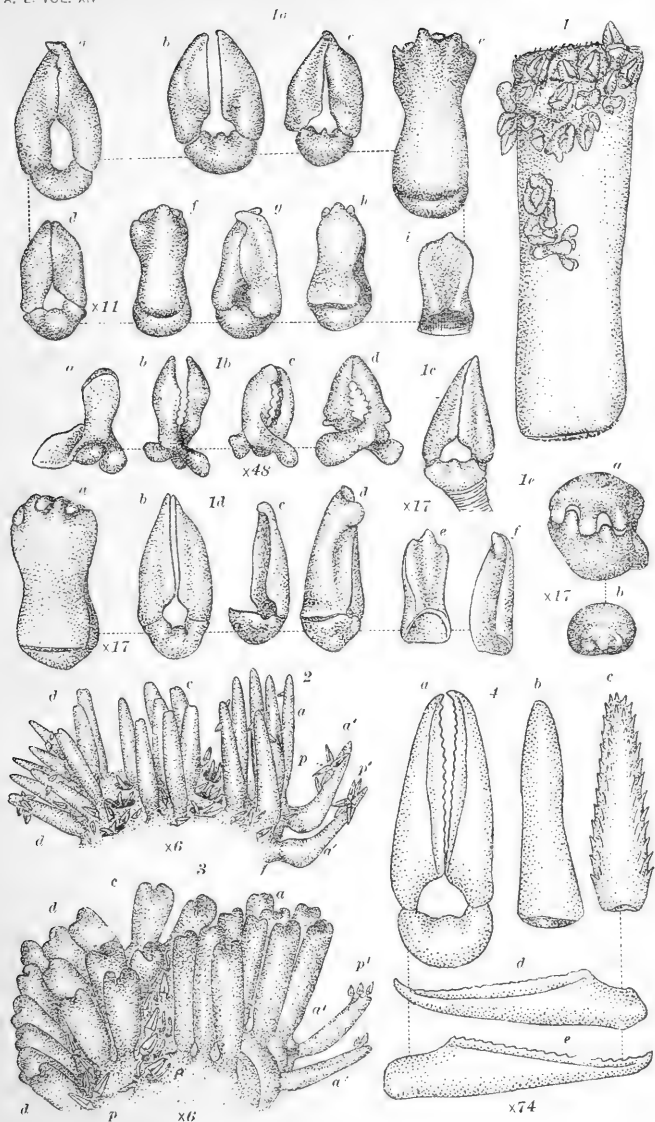
1-1d ORTHASTERIAS (STYLASTERIAS) FORRERI (LOR.)

2. *O. LEPTOLENA* VER. Type

3-3a. *ALLASTERIAS ANOMALA* VER. Type

PLATE LXXVIII.

- FIG. 1. *Orthasterias columbiana* Verrill. Cotype. A dorsal spine and minor pedicellariæ from the largest specimen from Victoria; $\times 13$. Prov. Mus. British Columbia.
- FIG. 1a. The same. Type. *a-i*, large dermal major pedicellariæ from the dorsal and lateral areas; $\times 11$.
- FIG. 1b. The same. Type. *a-d*, minor pedicellariæ; $\times 48$.
- FIG. 1c. The same. A pedicelled adambulacral major pedicellaria; $\times 17$.
- FIG. 1d. The same. Type. *a-f*, major pedicellariæ from the dorsal and lateral areas; $\times 17$.
- FIG. 1e. The same. End views of two of the larger major pedicellariæ; $\times 17$.
- FIG. 2. *Allasterias rathbuni nortonensis* Verrill. Adambulacral (*a*); peractinal (*c*); and inferomarginal (*d, d*) groups of spines; *a', a'*, inner or furrow-spines on alternate plates; *p, p*, papulæ and dermal pedicellariæ; *p', p'*, adambulacral pedicellariæ; $\times 6$.
- FIG. 3. *Allasterias anomala* Verrill. Type. $\times 6$. Lettering as in fig. 2.
- FIG. 4. The same. Major pedicellariæ (*a*) and detached valves (*c-e*); $\times 74$.



A. HYATT VERRILL DEL.

HELIOTYPER CO., BOSTON

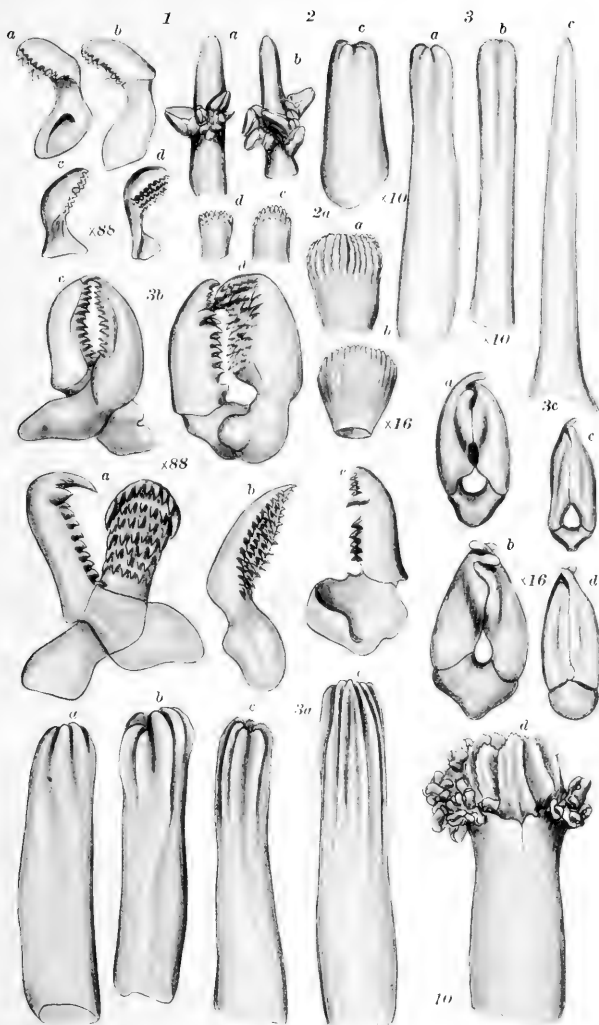
1-1c. ORTHASTERIAS COLUMBIANA VER. Cotype

2. *ALLASTERIAS RATHBUNI NORTONENSIS* VER.

3-4. A. ANOMALA VER. Type

PLATE LXXIX.

- FIG. 1. *Asterias polythela* Verrill. Type. Detached valves of minor pedicellariæ mounted in balsam; *a-d*; $\times 88$.
- FIG. 2. The same specimen. Spines and pedicellariæ; *a, b*, adambulacral spines; *c*, a marginal spine with pedicellariæ removed; $\times 10$.
- FIG. 2a. The same specimen. *a-d*, larger and smaller dorsal spines; $\times 16$.
- FIG. 3. *Orthasterias columbiana* Verrill. Largest specimen from Victoria. Cotype. Spines, with pedicellariæ and skin removed; *a, b*, outer adambulacral; *c*, inner one; $\times 10$.
- FIG. 3a. The same specimen. Spines cleaned of skin and pedicellariæ except *d*; *a, b*, dorsals; *c*, upper marginal; *d*, dorsal covered with a sheath bearing pedicellariæ near the tip; $\times 10$.
- FIG. 3b. The same specimen. Minor pedicellariæ mounted in balsam; *c, d*, entire; *a, b, e*, dislocated valves; $\times 88$.
- FIG. 3c. The same specimen. Dermal major pedicellariæ from the dorsal and lateral areas; $\times 16$.



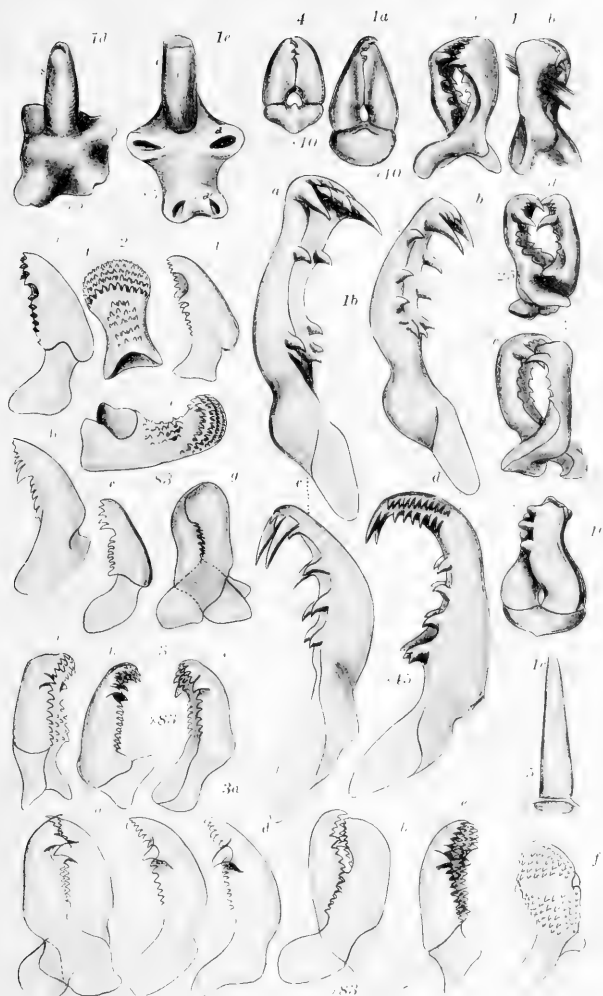
A. MYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-2a ASTERIAS POLYTHELA VER. Type
3-3c ORTHASTERIAS COLUMBIANA VER.

PLATE LXXX.

- FIG. 1. *Orthasterias forreri* (de Loriol) Verrill. Minor pedicellariæ, *a, b, c, d*, mounted in balsam; $\times 25$.
- FIGS. 1*a*, 1*a'*. The same specimen. Two large dorsal dermal major pedicellariæ; $\times 10$.
- FIG. 1*b*. The same specimen. *a-d*, four detached valves of minor pedicellariæ, mounted in balsam; $\times 45$.
- FIG. 1*c*. The same specimen. A cleaned dorsal spine; $\times 5$.
- FIGS. 1*d*, 1*e*. The same. Dorsal plates; $\times 5$. 1*d*, dorso-lateral with a spine; 1*e*, carinal seen from inner side; *c*, connective ossicle; *d, d'*, facets for articulation of transverse connective ossicles.
- FIG. 2. *Orthasterias dawsoni* Verrill. Type. *a-f*, disarticulated valves of minor pedicellariæ mounted in balsam; *g*, one entire; $\times 83$.
- FIGS. 3, 3*a*. *Orthasterias californica* Verrill. Type. Minor pedicellariæ mounted in balsam; 3*a, a, b*, are entire; the rest, *c, f*, are disarticulated valves; $\times 83$.
- FIG. 4. *Pisaster papulosus* Verrill. Type. Major pedicellaria; $\times 10$.



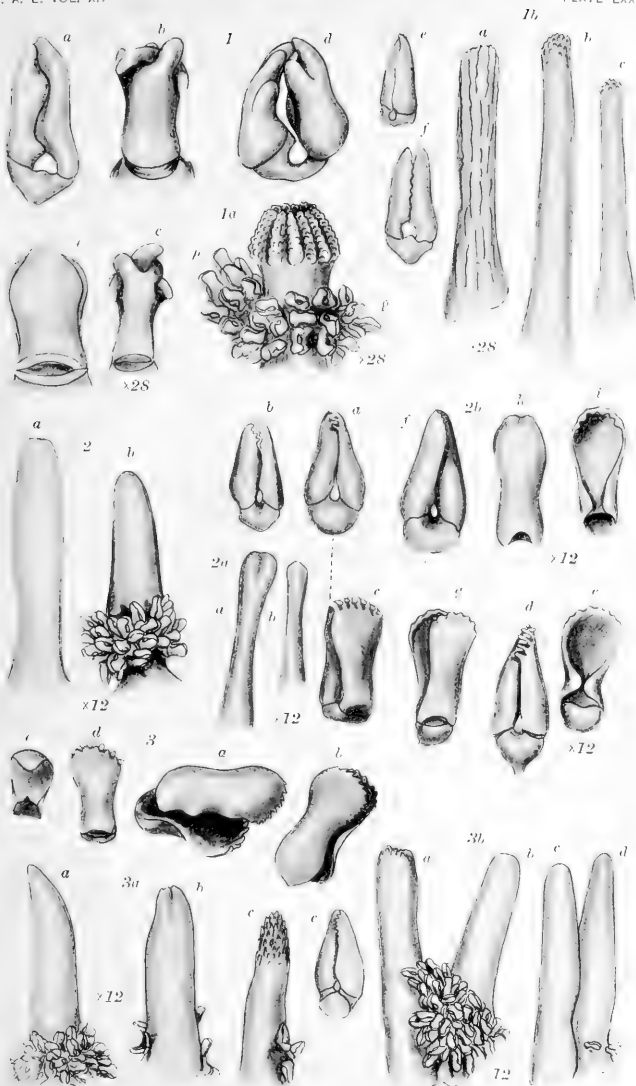
A. WYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

- 1-1e. *ORTHASTERIAS FORRERI* (LOR.) Type
 2. *O. DAWSONI* VER. Type
 3-3a. *O. CALIFORNICA* VER. Type
 4. *PISASTER PAPULOSIS* VER. Type

PLATE LXXXI.

- FIG. 1. *Distolasterias chelifera* Verrill. Type. Dermal major pedicellariæ; *a, b, c, d*, are elongate, strongly unguiculate forms; *e* is a stouter form, and not unguiculate; $\times 28$. No. 1346, Mus. Comp. Zoöl.
- FIG. 1a. The same specimen. One of the dorsal spines bearing a wreath of minor pedicellariæ, *P, P*; $\times 8$.
- FIG. 1b. The same specimen. Spines cleaned; *a*, marginal spine with pedicellariæ removed; *b*, outer adambulacral; *c*, inner adambulacral; *e, f*, adambulacral major pedicellariæ; $\times 28$.
- FIG. 2. *Orthasterias californica* Verrill. Type. *a*, an inferomarginal spine, cleaned; *b*, a dorsal spine with a wreath of minor pedicellariæ; $\times 12$.
- FIG. 2a. The same specimen. *a*, outer; *b*, inner adambulacral spine; $\times 12$.
- FIG. 2b. The same specimen. Major pedicellariæ; *a, b, c, d, e*, dorsal; *f, g*, adambulacral; *h, i*, actinal interradiæ; $\times 12$.
- FIG. 3. *Orthasterias dawsoni* Verrill. Type. Dermal major pedicellariæ; *a, b*, stout dorsal form; *c, d, e*, more slender spatulate or plateleiform sorts from the lateral area; $\times 12$.
- FIG. 3a. The same specimen. Spines; *a, b, c*, dorsal spines treated with Javelle water to remove most of the pedicellariæ; $\times 12$.
- FIG. 3b. The same specimen. Inferomarginal spines; *a, b*, a pair with pedicellariæ; *c, d*, a smaller pair cleaned with Javelle water; $\times 12$.



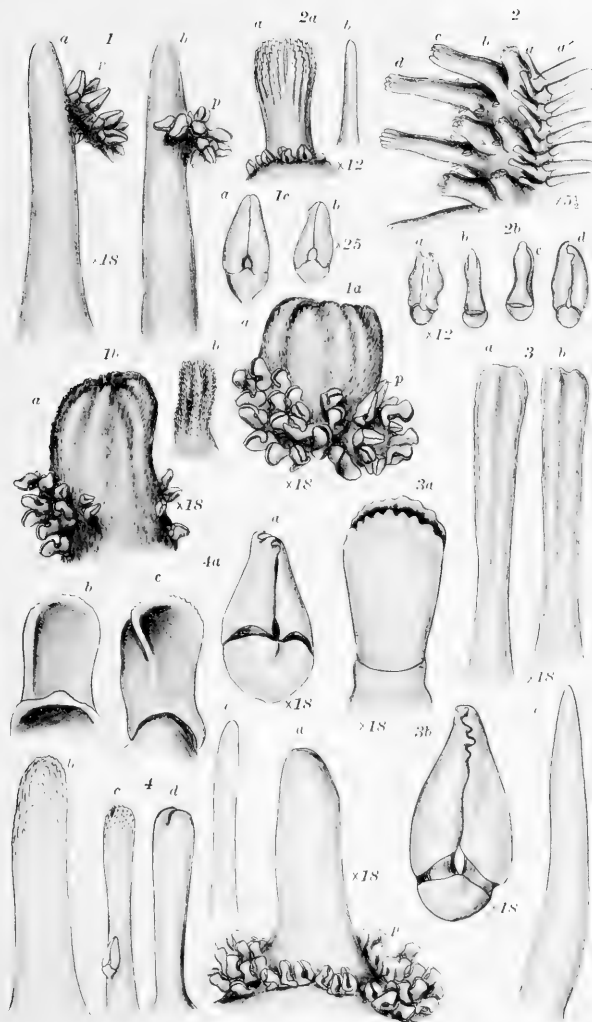
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

1-1b. DISTOLASTERIAS CHELIFERA VER. Type
 2-2b. ORTHASTERIAS CALIFORNICA VER. Type
 3-3b. O. DAWSONI VER. Type

PLATE LXXXII.

- FIG. 1. *Asterias victoriana* Verrill. Type. *a*, *b*, adambulacral spines with epispinal clusters, *p*, *p*, of pedicellariæ of both sorts; $\times 18$.
- FIG. 1a. The same specimen. Dorsal spines; *a*, one of the larger, and *b*, one of the smaller sorts; *P*, minor pedicellariæ; $\times 18$.
- FIG. 1b. The same specimen. An inferomarginal spine and minor pedicellariæ; $\times 18$.
- FIG. 1c. The same specimen. *a*, *b*, two of the major pedicellariæ; $\times 25$.
- FIG. 2. *Orthasterias biordinata* Verrill. Type. Group of spines of the actinal side; *a'*, inner, and *a*, outer adambulacrals; *b*, peractinals; *c*, *d*, inferomarginals; $\times 5\frac{1}{2}$.
- FIG. 2a. The same specimen. *a*, dorsal spine; *b*, adambulacral spine; $\times 12$.
- FIG. 2b. The same specimen. Dorsal dermal major pedicellariæ, front and profile views; $\times 12$.
- FIG. 3. *Orthasterias gonolena* Verrill. Spines cleaned with Javelle water; *a*, *b*, outer adambulacrals; *c*, marginal; $\times 18$. No. 1825, Mus. Comp. Zool.
- FIG. 3a. The same specimen. A large denticulate dermal major pedicellaria from the lateral or intermarginal area; $\times 18$.
- FIG. 3b. The same specimen. Major pedicellaria from the outer adambulacral spines; $\times 18$.
- FIG. 4. The same specimen (No. 1825). Spines; *a*, one of the dorsal spines with a basal wreath of minor pedicellariæ; *b*, inferomarginal, cleaned; *c*, *d*, outer adambulacrals; *e*, inner adambulacral; $\times 18$.
- FIG. 4a. The same; *a*, *b*, *c*, major pedicellariæ; details; $\times 18$.



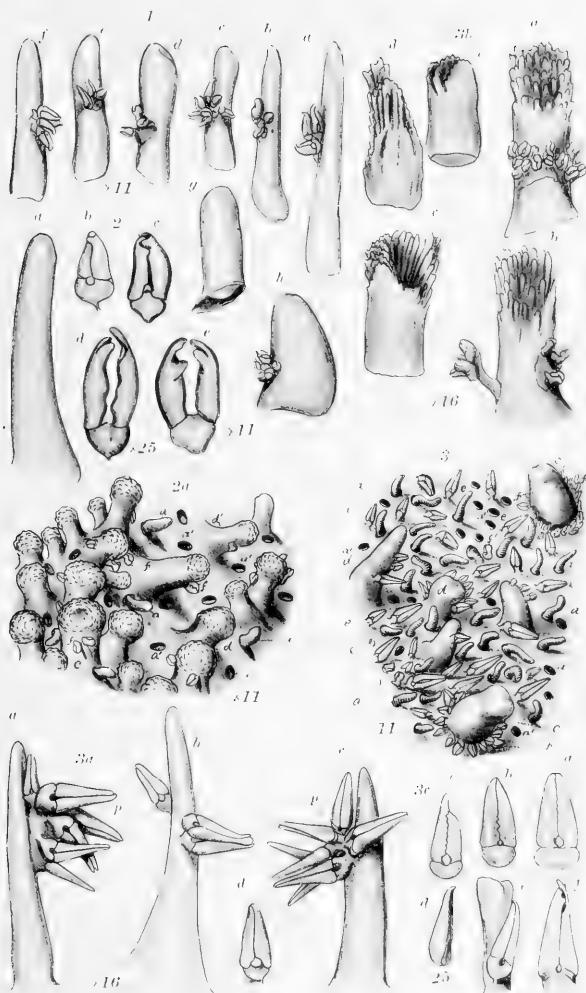
A. MYATT VERHILL DEL.

HELIOTYPE CO., BOSTON

1-1c. *ASTERIAS VICTORIANA* VER. Type
 2-2b. *ORTHASTERIAS BIORDINATA* VER. Type
 3-3b, 4, 4a. *GONOLENA* VER.

PLATE LXXXIII.

- FIG. 1. *Asterias katherinæ* Gray. Spines with pedicellariæ; *a*, adoral adambulacral; *b*, inner adambulacral; *c*, *d*, outer adambulacral; *e*, *f*, peractinals; *g*, *h*, inferomarginals; $\times 11$.
- FIG. 2. *Leptasterias arctica* (Murdoch). Spines and major pedicellariæ; *a*, adambulacral spine; *b*, *c*, adambulacral major pedicellariæ; *d*, axillary or interradial one; *e*, unguiculate marginal one; $\times 25$.
- FIG. 2*a*. The same specimen. Finer spined variety. Portion of the dorsal surface showing spines, *c*, *d*, *d'*; papulæ, *a*, *a*; minor pedicellariæ, *f*, *f*; papular pores, *a'*; $\times 11$.
- FIG. 3. *Allasterias forficulosa* Verrill. Type. Portion of the dorsal surface, showing spines, *c*, *d*; papulæ, *a*, *a*; papular pores, *a'*; dermal major pedicellariæ, *e*, *e*; circumspinal minor pedicellariæ, *f*, *f*; dermal minor pedicellariæ, *f'* *f'*; $\times 11$. Japan. No. 1183. Mus. Comp. Zool.
- FIG. 3*a*. The same specimen. Adambulacral spines, *a*, *b*, *c*, and attached major pedicellariæ, *P*, *P*; *d*, one of the same, detached; $\times 16$.
- FIG. 3*b*. The same specimen. *a-e*, marginal spines; $\times 16$.
- FIG. 3*c*. The same specimen. Major pedicellariæ; *a*, *b*, *c*, *d*, dorsal dermal; *e*, marginal; *f*, axillary; $\times 25$.



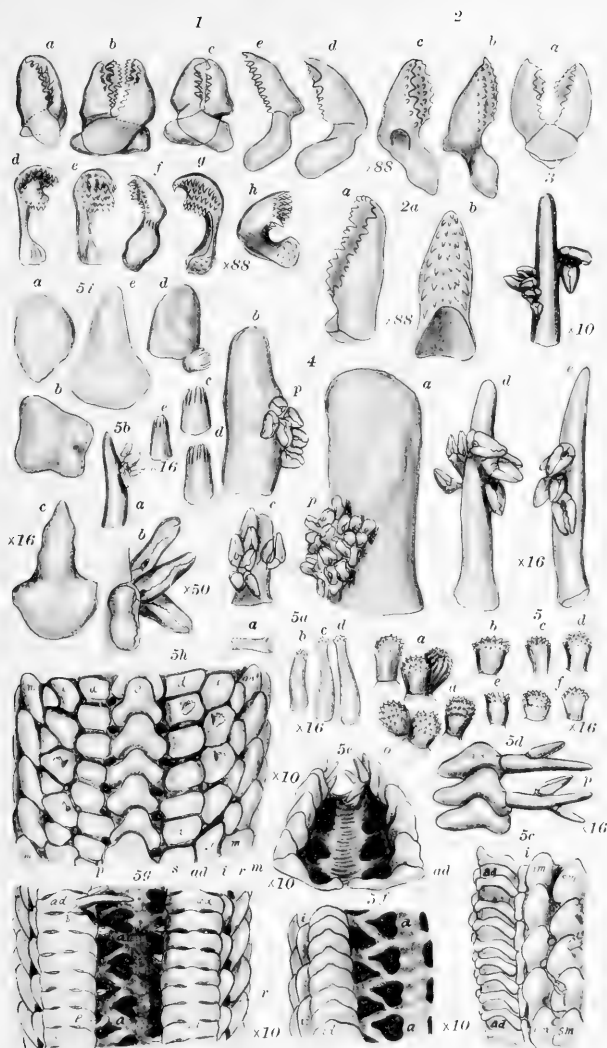
A. HYATT VERRILL DEL.

HELIOTYPE C. DENTON

1. *ASTERIAS KATHERINAE* GRAY
 2-2a. *LEPTASTERIAS ARCTICA* (MUR.)
 3-3c. *ALLASTERIAS PORFICULOSA* VER. Type

PLATE LXXXIV.

- FIG. 1. *Allasterias forficulosa* Verrill. Type. Minor pedicellariæ mounted in balsam; *a, b, c*, entire; *d-h*, detached valves; $\times 88$. Japan. No. 1183, Mus. Comp. Zool.
- FIG. 2. *Asterias multiclava* Verrill. Type. Minor pedicellariæ in balsam; *a*, entire; *b-c*, separated valves; $\times 88$.
- FIG. 2a. The same specimen. Dermal dorsal major pedicellariæ; *a, b*, separated valves; $\times 88$.
- FIG. 3. *Asterias polythela* Verrill. Type. Adambulacral spines and pedicellariæ; $\times 10$.
- FIG. 4. The same specimen. Spines with adhering pedicellariæ; *a, b, c*, dorsals; *d, e*, adambulacrals with major pedicellariæ; $\times 16$.
- FIG. 5. *Stenasterias macropora* Verrill. Type. *a-g*, dorsal spines, mostly from bases of rays; $\times 16$.
- FIG. 5a. The same specimen. Adambulacral spines, *a-d*; $\times 16$.
- FIG. 5b. The same specimen. *a*, adoral spine with pedicellariæ; *c, d, e*, marginal spines, $\times 16$; *b*, oral pedicellariæ, $\times 50$.
- FIG. 5c. The same. Group of ossicles of actinal side; *ad*, adambulacrals; *i*, peractinals; *im*, inferomarginals; *sm*, supramarginals; $\times 10$.
- FIG. 5d. The same. Adoral adambulacral plates (*ad*), and spine with pedicellariæ (*p*).
- FIG. 5e. The same. Adoral portion of the groove, with large pores of sucker-feet; *ad*, adambulacral plates; *o*, oral spines; $\times 10$.
- FIG. 5f. Portion of groove and plates from middle of ray; *a, a*, ambulacral plates and large pores; *ad*, adambulacral plates; *i*, peractinals; $\times 10$.
- FIG. 5g. The same. Segment of actinal side of a ray deprived of spines; *a, a*, ambulacral plates and large sucker pores (*s*); *a, d*, adambulacral plates; *i*, peractinals; *m*, inferomarginal; *b*, a remaining adambulacral spine; *p, p*, adambulacral pedicellariæ; *r, r*, papular pores; $\times 10$.
- FIG. 5h. The same. Dorsal side of ray, with spines removed; *c, c*, median or carinal row of plates; *d, d*, and *d' d'*, right and left secondary rows of plates; *e, e'*, second pair of secondary rows of plates; *m, m'*, superomarginal rows; single papular pores lie between the plates in rows; $\times 10$.
- FIG. 5i. The same. Skeletal ossicles; *a*, peractinal plate; *b*, superomarginal; *c*, inferomarginal; *d*, adambulacral; *e*, superomarginal; $\times 16$.



A. HYATT VERRILL DEL.

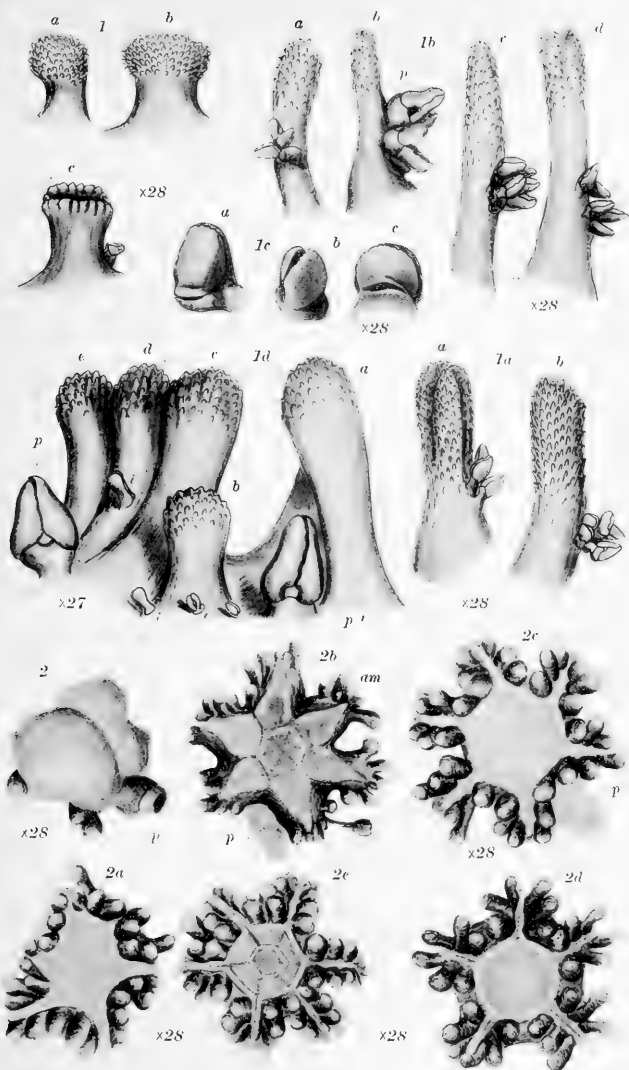
HELIOTYPE CO., BOSTON

1. *ALLASTERIAS FORFICULOSA* VER. Type
 2-2a. *ASTERIAS MULTICLAVA* VER. Type
 3, 4. *A. POLYTHELA* VER. Type
 5-5i. *STENASTERIAS MACROPORA* VER. Type



PLATE LXXXV.

- FIG. 1. *Leptasterias epichlora alaskensis* Verrill. Type. Dorsal spines, *a, b, c*, of different sorts; $\times 28$. Dutch Harbor.
- FIG. 1a. The same specimen; *a*, inferomarginal spine; *b*, superomarginal; $\times 28$.
- FIG. 1b. The same specimen; *a, b, c*, adambulacral spines; *d*, peractinal; $\times 28$.
- FIG. 1c. The same specimen; *a, b, c*, large, erect, intermarginal major pedicellariæ; $\times 28$.
- FIG. 1d. The same specimen; marginal spines and pedicellariæ; *a*, superomarginal spines; *b, c, d, e*, inferomarginals; *p, p'*, major pedicellariæ; *i, i'*, minor pedicellariæ.
- FIGS. 2-2e. The same. Young carried by parent, in different stages of growth; *a, b*, younger stages; *p*, pedicel for attachment; *a, m*, podia or ambulacral feet; $\times 28$. In 2, the form is irregular, with few podia; in 2a, the form has become stellate, but with unequal rays. Later stages are regularly stellate; 2d is five-rayed; the others are six-rayed like the parent.



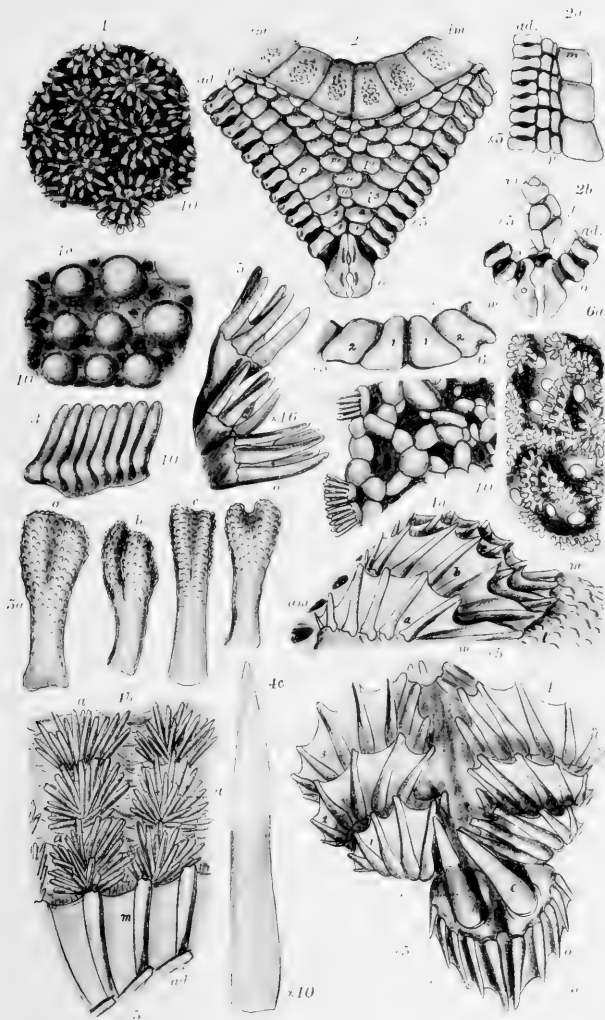
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

LEPTASTERIAS EPICHLORA ALASKENSIS VER. Type,
AND YOUNG OF THE SAME

PLATE LXXXVI.

- FIG. 1. *Bunodaster ritteri* Verrill. Type. A group of dorsal parapaxillæ from the base of a ray; $\times 10$.
- FIG. 1a. The same specimen. A group of dorsal plates from the base of a ray, with spines removed; $\times 10$.
- FIG. 2. *Dermasterias imbricata* (Grube). Young. One of the interactinal areas deprived of spines; *ad*, adambulacral plates, *o*, jaw plates; *im*, inferomarginals; *p*, *p*, first rows; *P*, *P*, second rows of interactinal plates; 1, 1 and 2, 2 and 3, 3, first three pairs of interactinal plates; *u*, *u*, odd or unpaired plates; $\times 5$.
- FIG. 2a. The same specimen; *ad*, adambulacral plates from near base of ray; *p*, two rows of interactinal plates; *m*, inferomarginals; $\times 5$.
- FIG. 2b. The same specimen; *o*, *o*, jaw-plates; *ad*, adoral adambulacrals; *f*, rudimentary plates, perhaps superambulacral; *ib*, interbrachial septum; $\times 5$.
- FIG. 2c. The same specimen. Supramarginal plates, from inner side; 1, 1 and 2, 2, first and second interradi al pairs; $\times 5$.
- FIG. 3. *Solaster stimpsoni* Verrill. Type. One of the adambulacral combs of spines.
- FIG. 4. *Pteraster tessellatus* Ives. A jaw and adoral parts; *o*, *o*, apical oral spines; *o'*, *o'*, lateral oral spines; *e*, *e*, hyaline epioral spines; 1, 2, 3, first three pairs of adambulacral combs; $\times 5$.
- FIG. 4a. The same specimen. Portion from near middle of radial area; *am*, ambulacral groove; *a-d*, four combs of adambulacral spines; *m*, *m*, actinomarginal spines; *l*, latero-ventral surface; $\times 5$.
- FIG. 4b. The same specimen. Part of an interbrachial area, rendered translucent by varnish; *a*, *a*, spinules of parapaxillæ as seen through the translucent skin; *m*, actinomarginal spines; *ad*, adambulacrals; $\times 5$.
- FIG. 4c. The same. One of the hyaline epioral spines; $\times 10$.
- FIG. 5. *Henricia sanguinolenta* var. *rudis* Verrill. A group of dorsal pseudopaxillæ from the base of a ray; $\times 16$. Point Franklin. No. 7623.
- FIG. 5a. The same specimen. *a-d*, adambulacral spines; $\times 16$.
- FIG. 6. *Henricia tumida borealis* Verrill. Type. A group of dorsal ossicles, mostly with spinules removed from the base of a ray; $\times 10$.
- FIG. 6a. The same specimen. Group of dorsal pseudopaxillæ, with spinules and papular pores; $\times 10$. Alaska, Harriman Expedition.



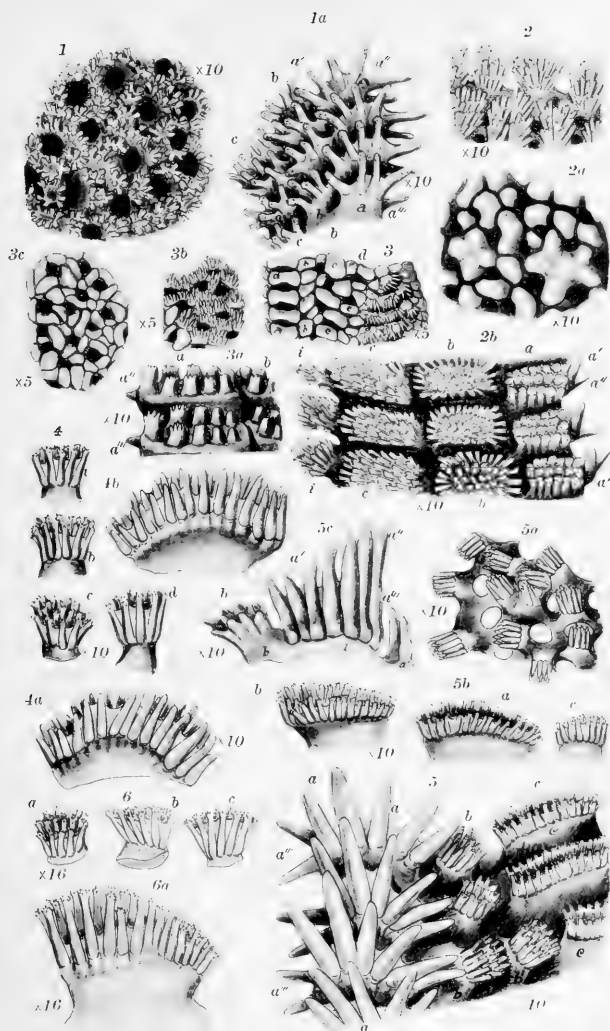
A. WYATT VERRILL DEL.

PLATE I

- 1-1a. *BUNODASTER RITTERI* VER. Type
 2-2c. *DERMASTERIAS IMBRICATA* (GRUBE)
 3. *SOLASTER STIMPSONI* VER. Type
 4-4c. *PTERASTER TESSELLATUS* IVES
 5-5a. *HENRICIA SANGUINOLENTA*, VAR. *RUDIS* VER
 6-6a. *H. TUMIDA BOREALIS* VER. Type

PLATE LXXXVII.

- FIG. 1. *Henricia tumida* Verrill. Type. Portion of dorsal surface; $\times 10$.
- FIG. 1a. The same specimen. Group of spines of actinal side; a' , a' , adambulacral; b , b' , peractinals; c , c' , inferomarginals; $\times 10$.
- FIG. 2. *Henricia leviuscula spiculifera* (Clark). Group of pseudopaxillæ from the side of the base of a ray; $\times 10$. Bering Sea.
- FIG. 2a. The same specimen. Group of dorsal ossicles with spines removed; $\times 10$.
- FIG. 2b. The same specimen. Portion of actinal side; a , a' , adambulacral plates and spines; a'' , furrow-spine; b , b , peractinal pseudopaxillæ; c , c , inferomarginals; d , d , superomarginals; $\times 10$.
- FIG. 3. *Henricia arctica* Verrill. Type. Cape Lisburne. Portion of actinal side with spines partly removed; a , a , adambulacral plates; b , b , peractinals; c , c , inferomarginals; d , d , superomarginals; e , e , intermarginals; $\times 5$.
- FIG. 3a. The same specimen. a , a , two adambulacral plates and spines; a' , furrow-spine; b , peractinal.
- FIG. 3b. The same specimen. Group of dorsal pseudopaxillæ; $\times 5$.
- FIG. 3c. The same specimen. Group of ossicles from base of ray; $\times 5$.
- FIG. 4. *Solaster endeca* (Linn.) Forbes. Typical from Atlantic; a , b , c , dorsal pseudopaxillæ from base of ray; d , superomarginal; $\times 10$.
- FIGS 4a, 4b. The same specimen. Inferomarginal plates; 4a, adoral side; 4b, aboral side; $\times 10$.
- FIG. 5. *Solaster galaxides* Verrill. Type. Portion of actinal side; a , a , adambulacral spines, actinal group; a' , furrow-spines; b , b , b' , peractinals; c , c , inferomarginals.
- FIG. 5a. The same specimen. Group of dorsal pseudopaxillæ and papular pores from the base of a ray; $\times 10$.
- FIG. 5b. The same specimen; a , adoral, and b , aboral sides of inferomarginal plates; c , superomarginal plate; $\times 10$.
- FIG. 5c. *Solaster galaxides* Verrill. Cotype. a , actinal group of adambulacral spines; a' , furrow-spines; b , peractinals. No. 1897, Mus. Comp. Zool.
- FIG. 6. *Solaster dawsoni* var. *arctica* Verrill. Type. Dorsal pseudopaxillæ, a , b , c , from base of ray; $\times 16$.
- FIG. 6a. The same specimen; inferomarginal plate; $\times 16$. From Point Franklin.



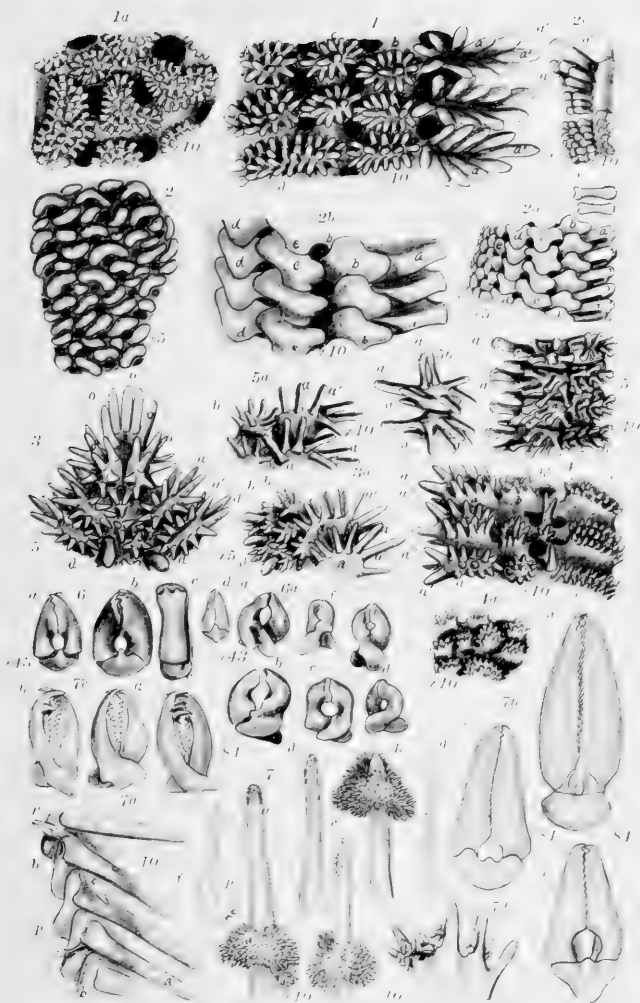
A. HYATT VERRILL DEL.

HELIOTYPE CO., BOSTON

- 1-1a. *HENRICIA TUMIDA* VER. Type
 2-2b. *H. LEVIUSCULA SPICULIFERA* (CLARK)
 3-3c. *H. ARCTICA* VER. Type
 4-4b. *SOLASTER ENDECA* (L.)
 5-5c. *S. GALAXIDES* VER. Type
 6-6a. *S. DAWSONI ARCTICUS* VER. Type

PLATE LXXXVIII.

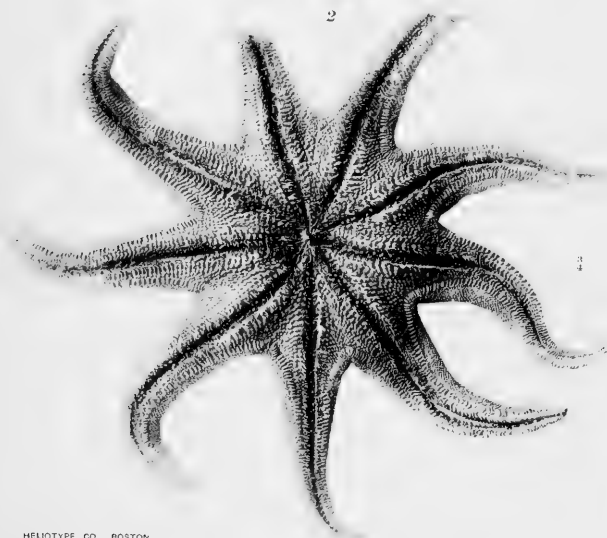
- FIG. 1. *Henricia leviuscula* var. *inequalis* Verrill. Type. Portion of the actinal side of a ray; *a*, *a*, enlarged adambulacral spines; *a'*, *a'*, longer adambulacral spines on inner angle of plate; *b*, inter-actinals; *c*, second row of interactinal pseudopaxillæ; *d*, inferomarginal plates and spines; $\times 10$. No. 5183, Yale Mus.
- FIG. 1a. The same specimen. Group of dorsal pseudopaxillæ and papulæ from base of a ray; $\times 10$.
- FIG. 2. *Henricia leviuscula* var. *lunula* Verrill. Type. Group of dorsal ossicles from the base of a ray, cleaned; $\times 5$. British Columbia. Yale Mus.
- FIG. 2a. The same specimen. Plates of the actinal side of the middle of a ray, cleaned; *a*, *a*, adambulacral; *b*, *b*, peractinals; *c*, *c*, inferomarginals; *d*, *d*, superomarginals; *e*, *e*, latero-dorsals; *f*, two adambulacral spines; $\times 5$.
- FIG. 2c. The same specimen. Plates of actinal side, more enlarged ($\times 10$). Lettering as in fig. 2a.
- FIG. 2c. The same specimen; *a*, adambulacral spines; *a'*, enlarged inner spine; *a''*, furrow-spine; *b*, peractinal spines; $\times 10$.
- FIG. 3. *Henricia sanguinolenta* (Müller). Typical form from New England. A jaw and adjacent parts; *o*, *o*, *o'*, apical or peroral spines; *o''*, *o''*, lateral adoral spines; *a'*, *a''*, adambulacral spines of first and second free plates; *d*, *d*, exsert papulæ; $\times 5$. Eastport, Me. (coll., A. E. Verrill). Yale Mus., No. 5099.
- FIG. 3a. The same specimen. Spines from the actinal side near the base of a ray; *a*, *a*, adambulacral plates; *a'*, *a''*, adambulacral spines; *a'''*, furrow spine; *b*, *b'*, interactinal spines; *d*, *d*, papulæ; $\times 5$.
- FIG. 4. *Henricia sanguinolenta miliaris* Verrill. Type. From a New England specimen. A portion of the actinal surface of the middle of a ray; $\times 10$. Lettering as in fig. 3a, with addition of *c*, *c*, the inferomarginal plates.
- FIG. 4a. The same specimen. Group of dorsal pseudopaxillæ from near base of a ray; $\times 10$. Eastport, Me. (coll., A. E. Verrill). Yale Mus.
- FIG. 5. *Henricia tumida borealis* Verrill. Type. Portion of plates and spines from the actinal side near the base of a ray; $\times 10$. Lettering as in figs. 3a and 4. Dutch Harbor, Alaska, Harriman Expedition. Yale Mus.
- FIG. 5a. The same specimen. *a*, *a*, ambulacral spines; *a'*, *a'*, larger spines on edge of groove; *b*, *b*, peractinal spines; $\times 10$.
- FIG. 5b. The same specimen. Adoral adambulacral plates and spines; $\times 10$. Lettering as in fig. 5a.
- FIG. 6. *Orthasterias forreri forcipulata* Verrill. Type. Larger dorsal, dermal, major pedicellariæ of three sorts; *a*, *b*, stout, erect denticulate form; *c*, spatulate or plate-like form; *d*, lanceolate form; $\times 43$.
- FIG. 6a. The same specimen. Minor pedicellariæ of different sizes, *a-f*; $\times 43$.
- FIG. 7. *Pycnopodia helianthoides* (Brandt). Spines; *a*, *b*, *c*, dorsals with wreaths of minor pedicellariæ; *d*, the same, cleaned of the pedicellariæ; *f*, an adambulacral spine with a pedicellaria (*P*) attached to its base by a pedicel on the edge of the furrow; *g*, an adoral spine, cleaned; $\times 10$.
- FIG. 7a. The same specimen. A group (*b*, *b*) of adambulacral overlapping plates; *a*, *a*, adambulacral spines; *p*, *p*, major pedicellariæ on slender pedicels; $\times 10$.
- FIG. 7b. The same specimen. *a*, *b*, *c*, three forms of small lanceolate major pedicellariæ; $\times 84$.
- FIG. 7c. The same specimen. *a*, *b*, *c*, three of the minor pedicellariæ; $\times 84$.
- FIG. 7d. The same specimen. One of the jaws with apical or peroral spines and pedicellariæ; $\times 10$.



1-1a. *HENRIELLA* (H. *VER.* 1922)
 2-2c. *H. LEVISCULA* (H. *VER.* 1922)
 3-3a. *H. SANGUINOLA* (H. *VER.* 1922)
 4-4a. *H. SANGUINOLENTA MILIARIS* (H. *VER.* 1922)
 5-5b. *H. TUMIDA BOREALIS* (H. *VER.* 1922)
 6-6a. *ORTHASTERIAS FORRLI* (H. *VER.* 1922)
 7-7d. *PYCNOPODIUM HILLIANTHOIDES* (H. *VER.* 1922)

PLATE LXXXIX.

- FIG. 1. *Solaster endeca* (Linn.) Forbes. Typical. Actinal side of a large New England specimen; $\frac{4}{9}$ natural size. Eastport, Me. Yale Mus.
- FIG. 2. *Solaster galaxides* Verrill. Type. $\frac{3}{4}$ natural size. Vancouver Is.



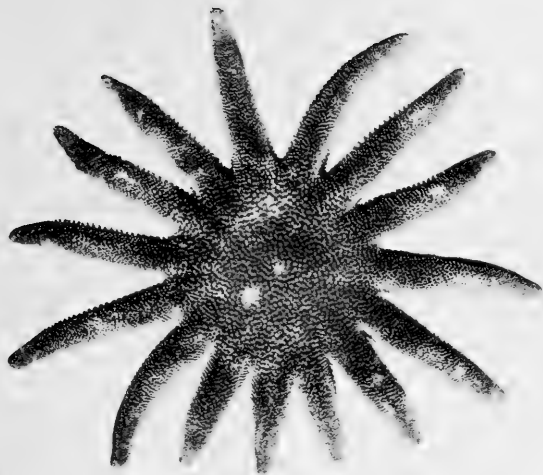
HELIOTYPE CO., BOSTON

1. SOLASTER ENDECA (L.) ATLANTIC
2. S. GALAXIDES VER. TYPE

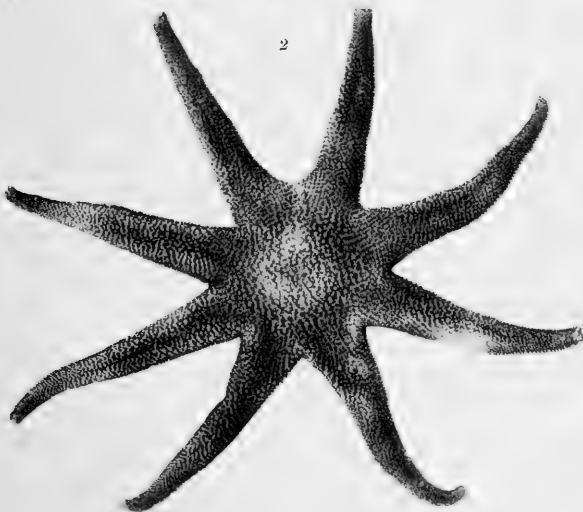
PLATE XC.

- FIG. 1. *Solaster dawsoni* Verrill. Form with different rays; about natural size. Vancouver I., Surv. Canada.
- FIG. 2. *Solaster constellatus* Verrill. Type. About $\frac{3}{4}$ natural size.

1



2



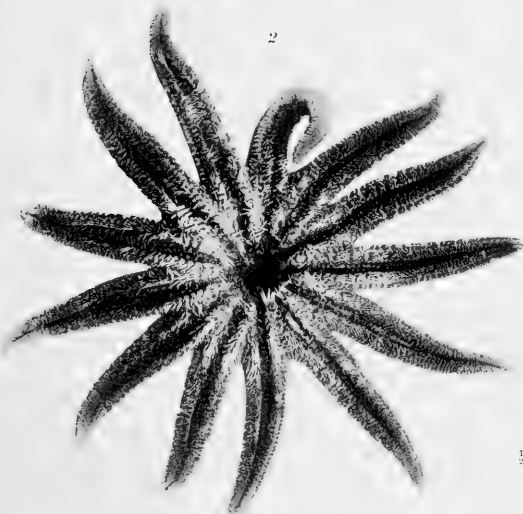
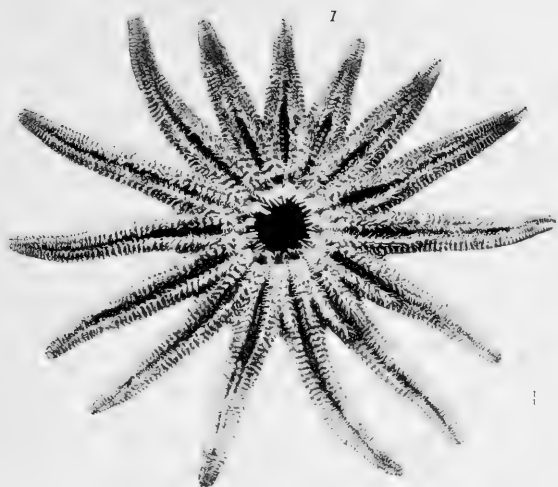
HELIOTYPE CO., BOSTON

1. SOLASTER DAWSONI VER.

2. SOLASTER CONSTELLATUS VER. Type

PLATE XCI.

- FIG. 1. *Solaster dawsoni* Verrill. Form with fifteen rays. Actinal side; about natural size.
- FIG. 2. *Solaster dawsoni* Verrill. Cotype. Actinal side; about $\frac{1}{2}$ natural size. Powell Is. Geol. Surv. Canada.

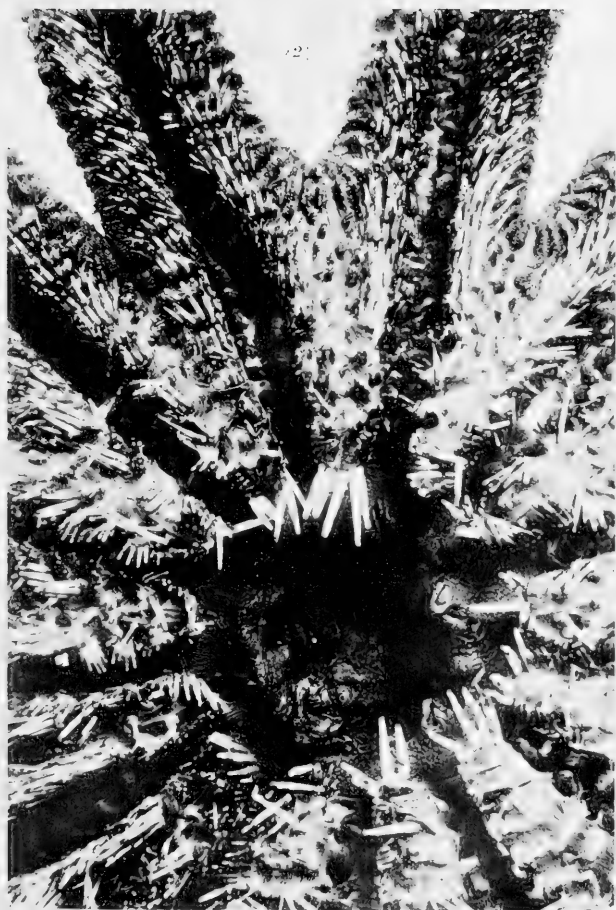


HELIOTYPE CO., BOSTON

1, 2. SOLASTER DAWSONI VER.

PLATE XCII.

FIG. 1. *Solaster dawsoni* Verrill. Cotype. Same specimen as pl. xc, fig. 2.
Actinal side; $\times 2\frac{2}{3}$. Powell Is.

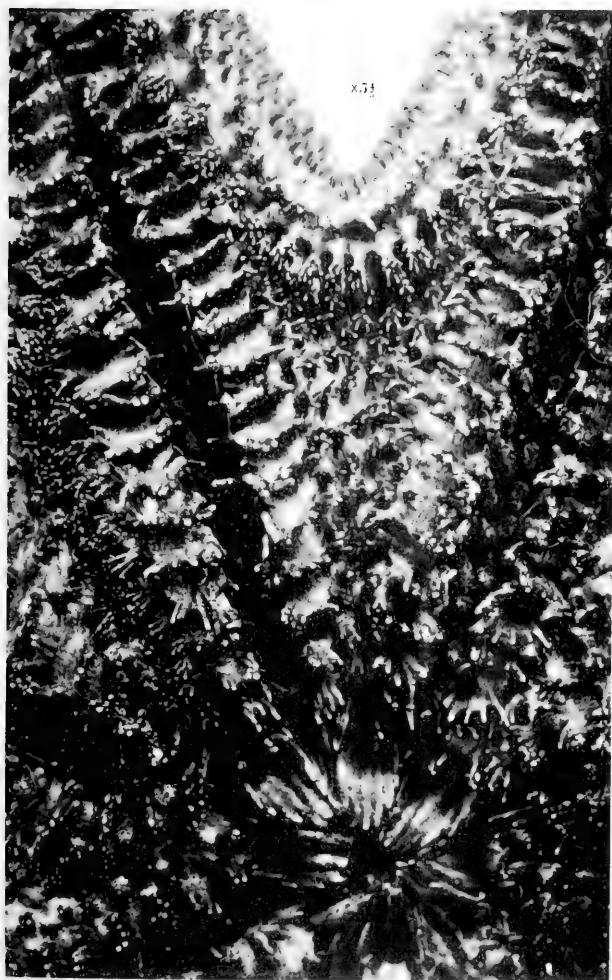


HELIXTYPE CO., BOSTON

SOLASTER DAWSONI VER. Cotype

PLATE XCIII.

FIG. 1. *Solaster constellatus* Verrill. Type. Actinal side; $\times 5\%$. Puget Sound. Mus. Univ. of Wash.



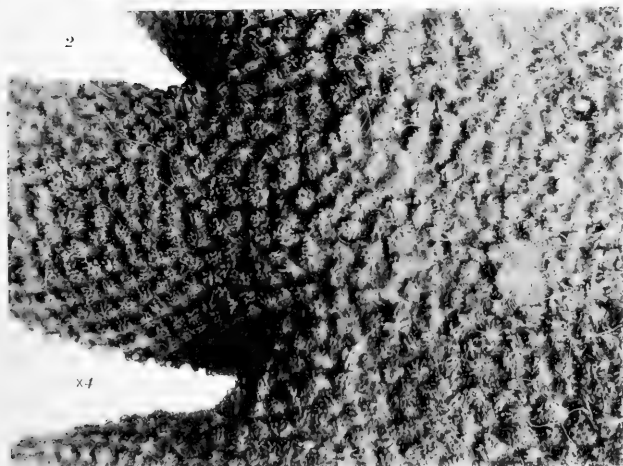
PHOTOGRAPH BY J. H. H. H.

SOLASTER CONSTELLATUS VER. Type

PLATE XCIV.

FIG. 1. *Solaster constellatus* Verrill. Type. Dorsal side; $\times 3$.

FIG. 2. *Solaster stimpsoni* Verrill. Type. Dorsal side; $\times 4$.



MELIOTYPE CO., BOSTON

1. *SOLASTER CONSTELLATUS* VER. Type
2. *SOLASTER STIMPSONI* VER. Type

PLATE XCV.

FIG. 1. *Solaster stimpsoni* Verrill. Type. Dorsal side; $\times 13\frac{1}{4}$. No. 5407,
Yale Mus.

(192)



XI³₄

HELIOTYPE CO., BOSTON

SOLASTER STIMPSONI VER. Type

PLATE XCVI.

FIGS. 1, 2. *Pteraster hebes* Verrill. Type. Profile and dorsal views; 1,
× about $1\frac{7}{8}$; 2, × 2. Departure Bay. Geol. Surv. Canada.

(194)



x17



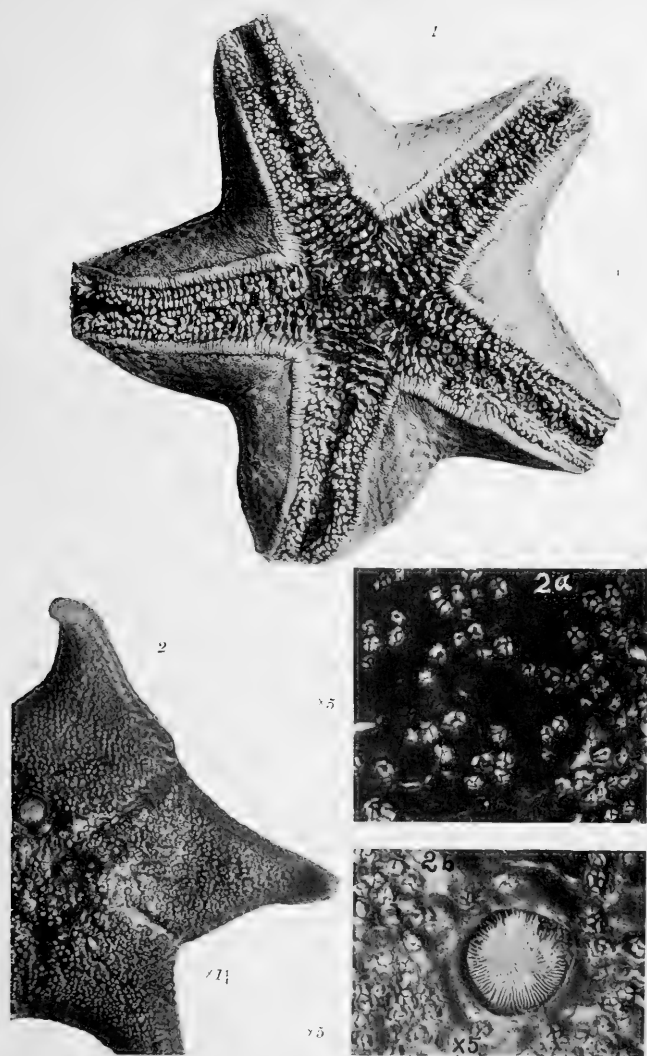
x2

HELIOGRAPH CO., BOSTON

1.2. PTERASTER HERES VER. Type

PLATE XCVII.

- FIG. 1. *Pteraster tessellatus* Ives. Actinal side of an alcoholic specimen from Alaska; about $\frac{3}{4}$ natural size. Yale Mus.
- FIG. 2. *Dermasterias imbricata* (Grube), var. *valvifera* Verrill. Type. Dorsal side, showing abundant pedicellariæ; $\times 1\frac{1}{4}$. Yale Mus.
- FIGS. 2a, 2b. The same specimen. Portions of disk; $\times 5$. 2a, shows many three-valved pedicellariæ and some four-valved; fig. 2b, shows also the madreporite.



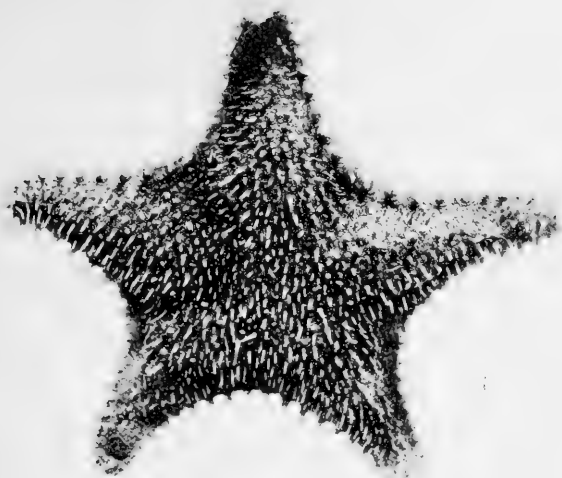
HELICTYPE CO., BOSTON

1. *PTERASTER TESSELLATUS* IVES
2-2b. *DERMASTERIAS IMBRICATA VALVULIFERA* VER. Type

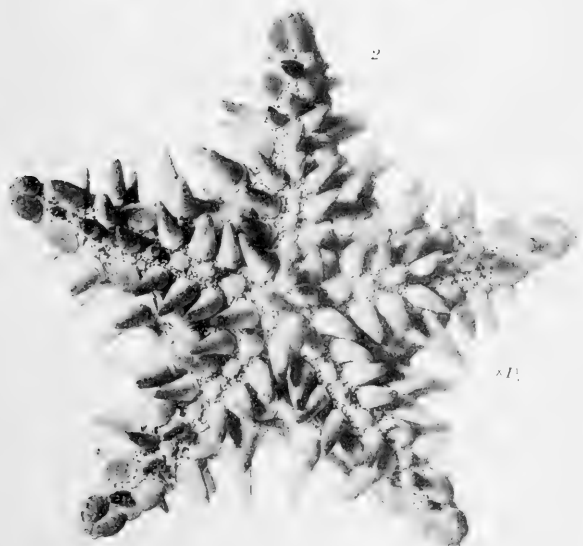
PLATE XCVIII.

- FIG. 1. *Hippasteria spinosa* Verrill. Type. Dorsal side; $\frac{2}{3}$ natural size.
Puget Sound. Univ. of Wash.
- FIG. 2. *Amphiaster insignis* Verrill. Type. Dorsal side; $\times 1\frac{1}{2}$. La Paz,
Lower Calif. Yale Mus.

1



2



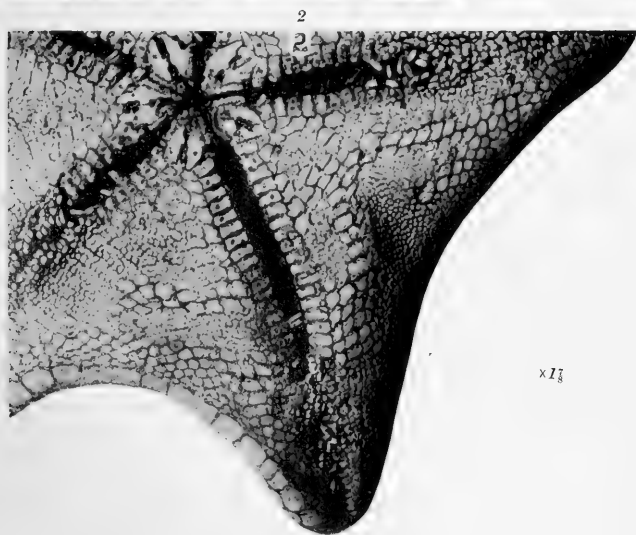
HELIO TYPE CO., BOSTON

1. HIPPASTERIA SPINOSA VER. Type
2. AMPHASTER INSIGNIS VER. Type

PLATE XCIX.

FIG. 1. *Tosiaster arcticus* Verrill. Dorsal side; $\times 1\frac{3}{4}$.

FIG. 2. The same specimen. Actinal side; $\times 1\frac{7}{8}$. Bering Is. U. S. Nat. Mus.

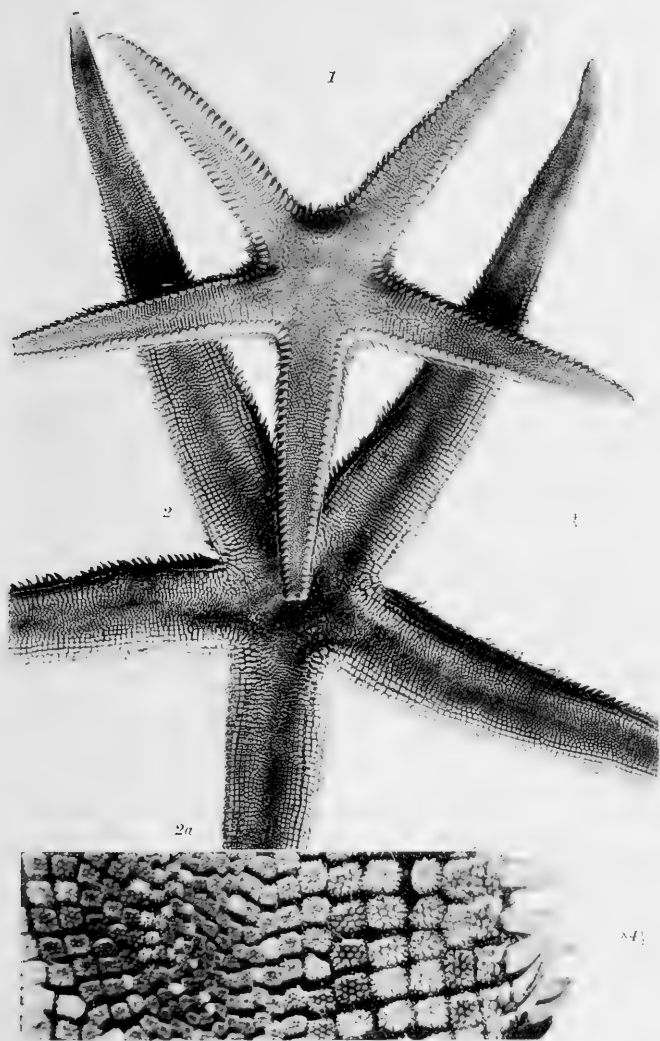


HELIOTYPE CO., BOSTON

1. 2. *TOSIASTER ARCTICUS* VER. Type

PLATE C.

- FIG. 1. *Astropecten californicus* Fisher; $\frac{1}{2}$ natural size. San Francisco.
FIG. 2. *Luidia foliolata* (Grube). Dorsal side; $\frac{1}{5}$ natural size. San Francisco.
FIG. 2a. The same. Portion of a ray; $\times 4\frac{1}{2}$.



HELIOTYPE CO., BOSTON

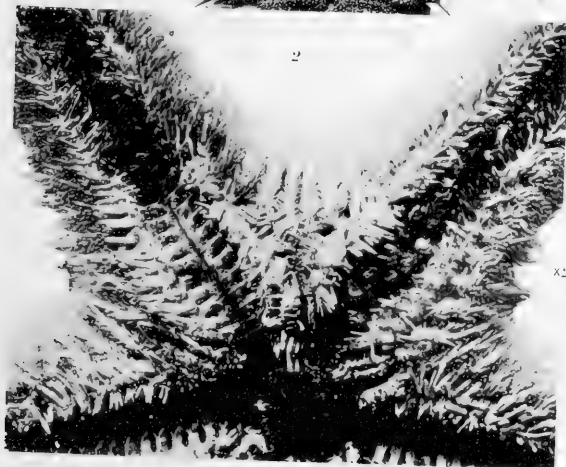
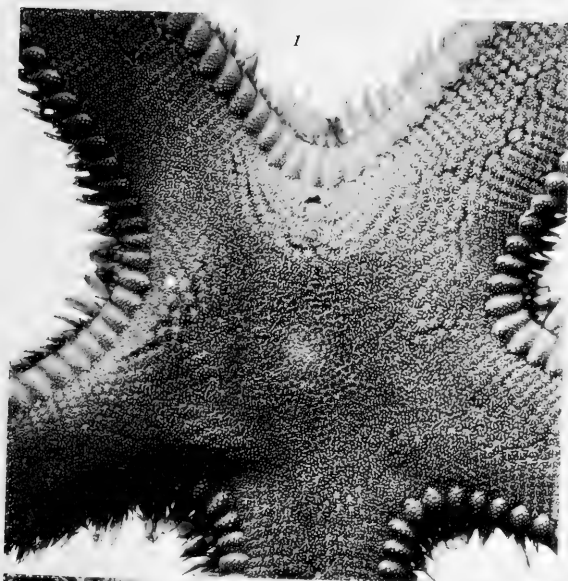
1. *ASTROPECTEN CALIFORNICUS* FISHER

2.a. *LUIDIA FOLIOLATA* GRUBE



PLATE CI.

- FIG. 1. *Astropecten californicus* Fisher. Dorsal side; $\times 3$. San Francisco.
FIG. 2. The same specimen. Actinal side; $\times 2\frac{1}{3}$.

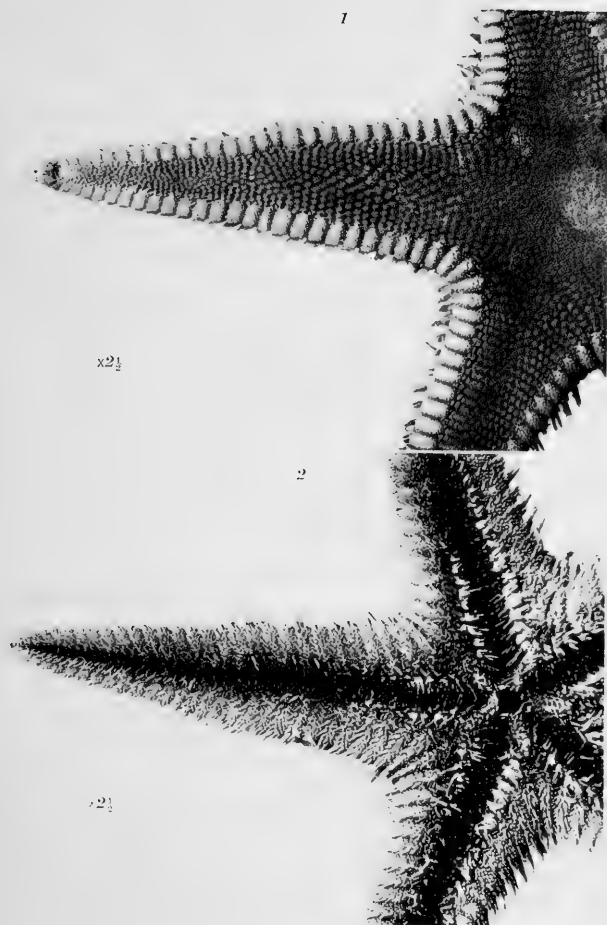


HELIO TYPE CO., BOSTON

ASTROPECTEN CALIFORNICUS FISHER

PLATE CII.

- FIG. 1. *Astropecten californicus* Fisher. Young. Dorsal side; $\times 2\frac{1}{2}$. Off
San Francisco. Yale Mus.
FIG. 2. The same specimen. Actinal side; $\times 2\frac{1}{2}$.



HELIOTYPE CO., BOSTON

1,2. *ASTROPECTEN CALIFORNICUS* FISHER (YOUNG)

PLATE CIII.

- FIG. 1. *Luidia clathrata* (Say). Dorsal side of ray; $\times 2\frac{1}{2}$. Bermuda.
FIG. 2. *Luidia foliolata* (Grube). Dorsal side; $\times 2\frac{1}{2}$. San Francisco.
Yale Mus.



HELIOTYPE CO., BOSTON

1. *LUIDIA CLATHRATA* SAY.
2. *LUIDIA FOLIOLATA* GRUBE.

PLATE CIV.

- FIG. 1. *Bunodaster ritteri* Verrill. Type. Actinal side; $\times 3\frac{1}{2}$. Off San Francisco. Yale Mus.
- FIG. 2. The same specimen. Dorsal side with spines removed on base of one ray; $\times 3\frac{1}{2}$.

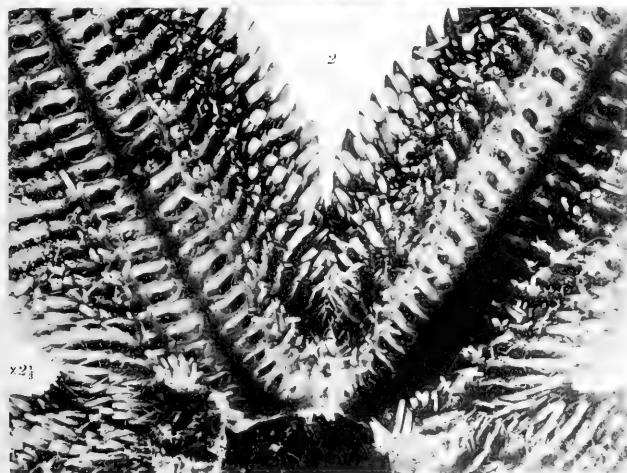
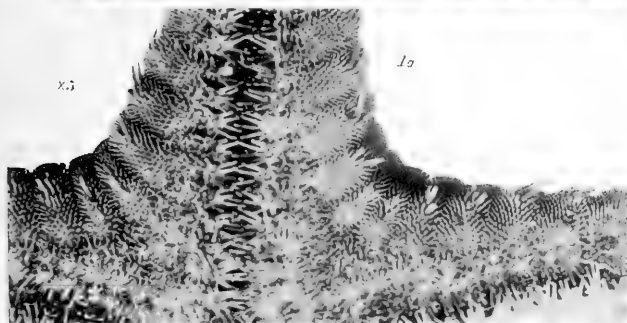
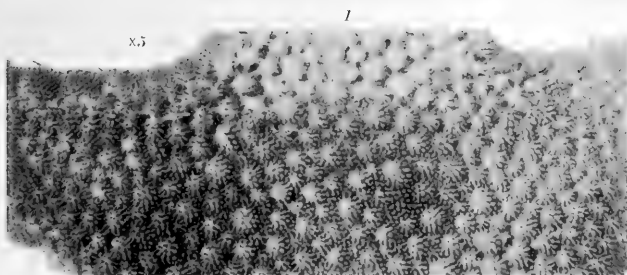


HELIOTYPE CO., BOSTON

BUNODASTER RITTERI VER. Type

PLATE CV.

- FIGS. 1, 1a. *Bunodaster ritteri* Verrill. Type. Portions of the dorsal and actinal surface; $\times 5$. San Francisco.
- FIG. 2. *Luidia foliolata* (Grube). Same specimen as pl. c, fig. 2. Actinal side; $\times 2$. Off San Francisco.



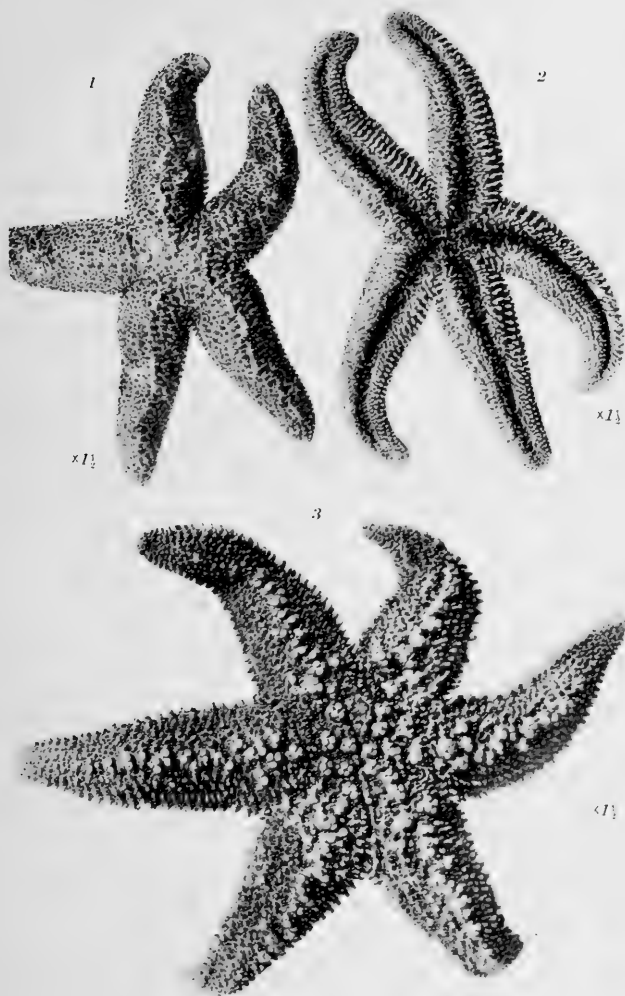
HELIOTYPE CO., BOSTON

1. 12. *BUNODASTER RITTERI* VER.

2. *LUIDIA FOLIOLATA* GRUBE

PLATE CVI.

- FIGS. 1, 2. *Evasterias troschelii* (Stimpson) Verrill. Young. Dorsal and actinal sides; $\times 1\frac{1}{2}$. Sitka. Yale Mus.
- FIG. 3. *Asterias acervata* Stimpson. A strongly acervate young specimen; $\times 1\frac{1}{2}$. Nazan, Alaska (Dall). U. S. Nat. Mus.

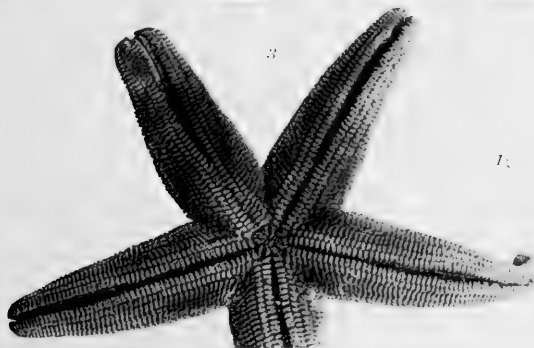


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- 1, 2. *EVASTERIAS TROSCHELII* (ST.) YOUNG
 3. *ASTERIAS ACERVATA* (ST.) YOUNG, VAR.

PLATE CVII.

- FIG. 1. *Mithrodia bradleyi* Verrill. Type. Dorsal side; $\frac{3}{4}$ natural size.
Yale Mus.
- FIG. 2. *Echinaster tenuispinus* Verrill. Type. Dorsal side; $\frac{3}{4}$ natural size.
La Paz. Yale Mus.
- FIG. 3. *Henricia leviuscula spiculifera* Clark. Actinal side; $\times 1\frac{7}{8}$. Bering
Island. U. S. Nat. Mus.



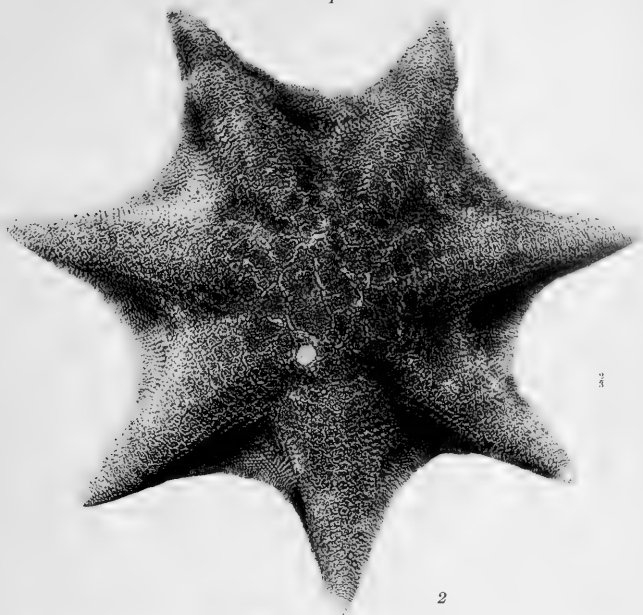
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1. *MITHRODIA BRADLEYI* VER. Type
2. *ECHINASTER TENUISPINUS* VER. Type
3. *HENRICIA LEVIUSCULA SPICULIFERA* (CLARK)

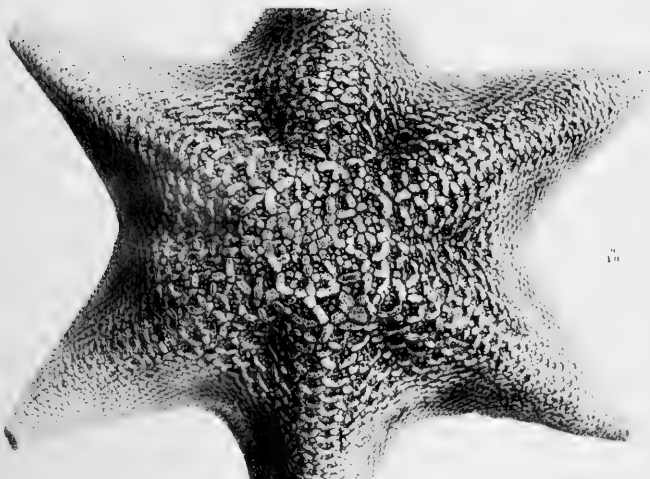
PLATE CVIII.

- FIG. 1. *Patiria miniata* (Brandt). A seven-rayed specimen. Dorsal side; about $\frac{2}{3}$ natural size. Departure Bay, Canada Geol. Survey.
- FIG. 2. The same. A six-rayed specimen. Dorsal side; about $\frac{9}{10}$ natural size. Departure Bay, Canada Geol. Survey.

1



2

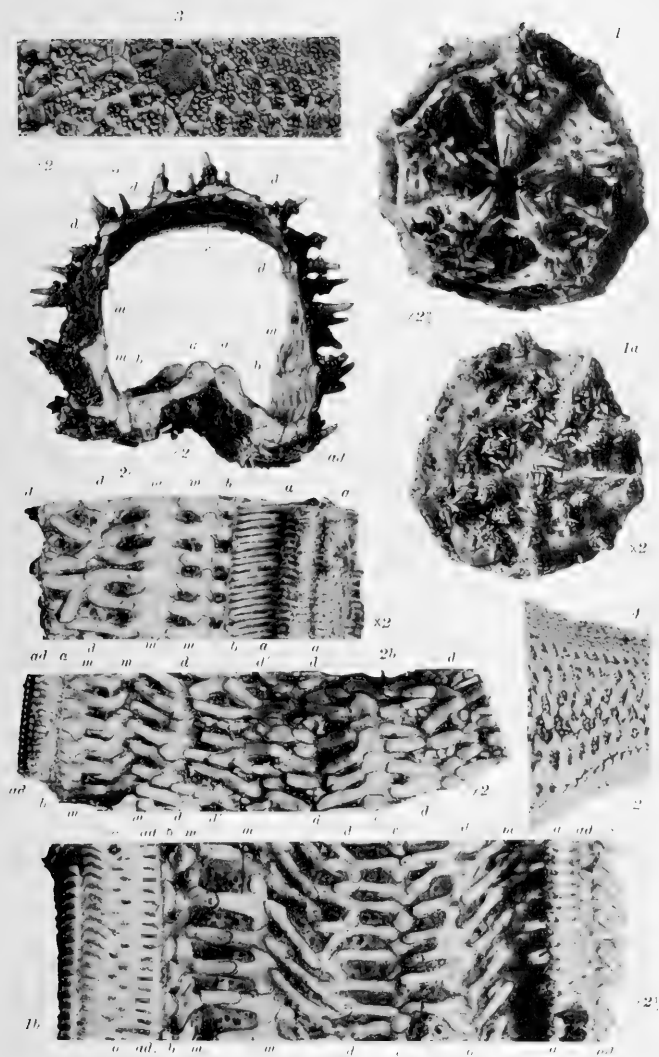


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1. 2. PATIRIA MINIATA VER. Varieties

PLATE CIX.

- FIG. 1. *Orthasterias tanneri* Verrill. Cotype. Actinal side of disk, to show jaws and peroral spines; $\times 2\frac{2}{3}$.
- FIG. 1a. The same specimen. Dorsal side of disk, showing spines and pedicellariæ; $\times 2$.
- FIG. 1b. The same specimen. Section of a ray, showing inner surface of skeleton; cut through ambulacral plates and flattened out; *a, a*, ambulacral plates; *ad, ad*, adambulacral plates; *b, b*, peractinal plates; *m, m*, inferomarginals; *m', m'*, superomarginals; *d, d*, dorso-lateral plates and transverse connective ossicles; *s, s*, adambulacral spines; *c, c*, median radial or carinal plates; $\times 2\frac{1}{3}$.
- FIG. 2. *O. columbiana* Verrill. Type. Transverse section of a ray; *a, a*, ambulacral plates; *ad, ad*, adambulacrals; *b, b*, peractinals; *m, m*, inferomarginals; *m', m'*, superomarginals; *d, d*, dorso-lateral plates and transverse ossicles; *c*, carinals; $\times 2$.
- FIGS. 2a, 2b. The same specimen. Two parts of a transverse section of a ray, split through the ambulacral plates and flattened out, to show inner surface. Lettering as in fig. 1b, except that *d, d*; *d' d'*; *d'', d''* show the three rows of dorso-lateral plates; $\times 2$.
- FIG. 3. *Patiria miniata* (Brandt). Central part of disk and madreporic plate, with spinules removed; $\times 2$.
- FIG. 4. *Enoplopatiria siderea* Verrill. Type. Dorsal view of middle of a ray with spinules removed; $\times 2$.



1-1b. ORTHASTERIAS TANNERI VER. Cotype

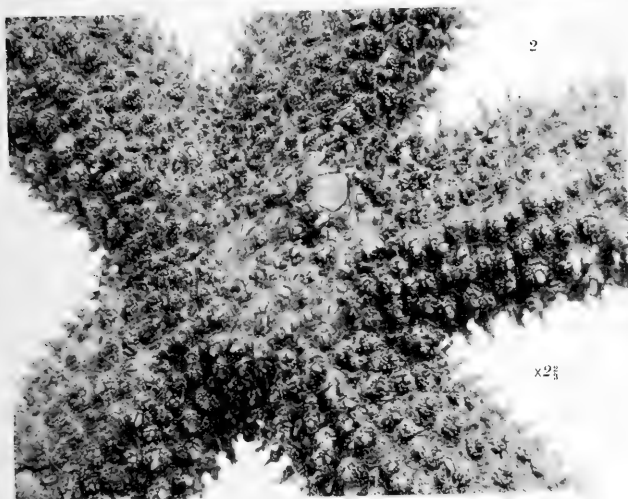
2-2b. O. COLUMBIANA VER. Type

3. PATIRIA MINIATA (BR.)

4. ENOPLPATIRIA SIDEREA VER. Type

PLATE CX.

FIGS. 1, 2. *Distolasterias chelifera* Verrill. Type. Ventral and dorsal views;
 $\times 2\frac{2}{3}$.



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1-2. *DISTOLASTERIAS CHELIFERA* VER. Type



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